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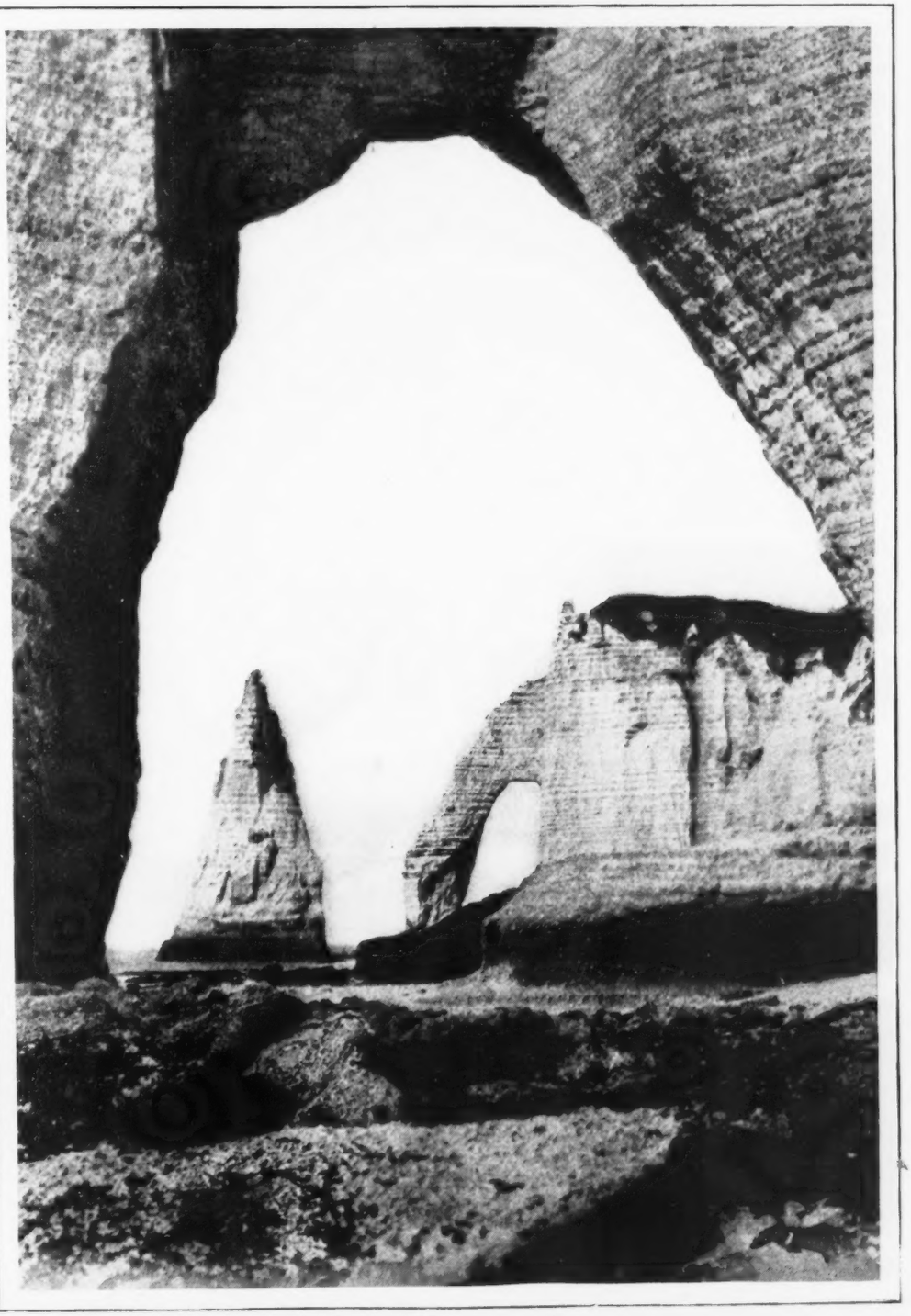


Drilling With Detachable Bits at Anyox

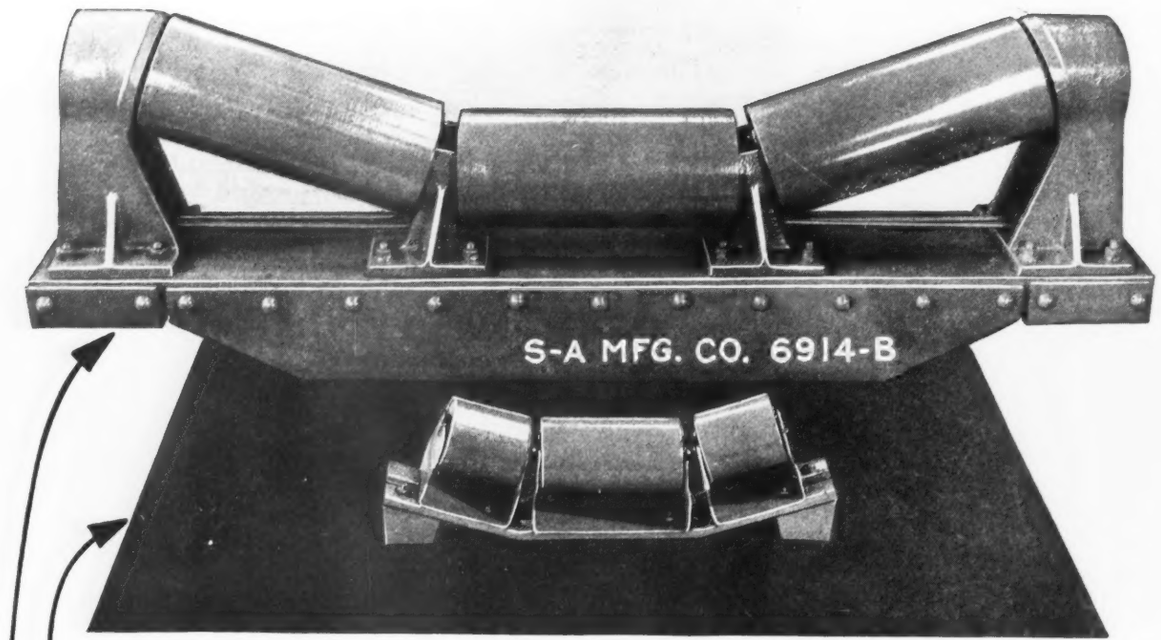
By William J. Coulter

Manitoba: A Potential Canadian Mining Area

By Harold P. Prather

Mica Mining and Milling Methods

By Toner Antisell



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ENGINEERING AND
MINING JOURNAL

JOSIAH EDWARD SPURR, Editor

Volume 122 New York, December 4, 1926 *Number* 23

Mining Engineering Seniors, and Others

THERE are in the colleges of the United States, according to the figures of the Society for the Promotion of Engineering Education, about 9,000 senior students for engineering degrees, of which 7,900 have been classified, as follows:

Seniors in civil engineering	2,044
Seniors in mechanical engineering	2,148
Seniors in electrical engineering	2,482
Seniors in mining and metallurgical engineering	426
Seniors in chemical engineering	801

These figures have not been checked: if the graduating mining engineers are too few in number, we should be glad if the above figures could be corrected. It is evident that Eastern mining schools have languished, in some cases almost to the point of extinction; while Mid-Western mining schools have the bulk of the students. We do not have at hand the number of colleges which are equipped to turn out mining engineers; but clearly if this number were divided into the number of senior mining students above mentioned, the average would be small. And the number of graduated mining engineers relative to the graduates in other departments of engineerng is also strikingly small, when viewed in comparison to the total number of members in the A.I.M.E., as compared with the other three founder societies: the A.I.M.E. membership compares favorably with the others.

The enumeration of graduating students of engineering above given probably indicates well enough the current trend: it shows the preponderance of the field of electricity, with mechanical and civil engineering following close behind. These are the soldiers of the age of mechanization: the young field of chemical engineering, growing rapidly, is depicted by 800 students in chemical engineering—a third of the number graduating in electricity; while the one listed field of productive engineering—mining and metallurgy—shows only half as many as chemical engineering and a sixth as many as those about to take charge of the operation of electricity. When it is considered that this production group embraces both coal and metal mining, the figures become still more significant.

It is difficult to believe that the listed number of senior students in mining and metallurgy is not abnormally small. A few years ago the depression in mining, together with the tendency toward centralization of management of mining operations, produced a floating surplus of mining engineers, and a consequent discouragement of new students. In the future, coal mining should need more engineers rather than fewer, for the coal industry is under-engineered; and the metal-mining enterprises of the world will still look largely to the mining schools of the United States for recruits of new technologists and managers.

As compared with the listed number of 426 senior students in mining, *Engineering and Mining Journal* has 225 student subscribers, and *Coal Age* 102, a total of 327—a figure which leads one to inquire again whether the figure of the total number of senior students given is quite correct at the present time.

Consolidation of Metal Producers

CONSOLIDATION of European metal interests continues, possibilities in this direction being much greater abroad than in the United States, owing to the limitations of the Sherman anti-trust law. The European steel cartel was recently announced. Copper is in the hands of Copper Exporters, Inc., which is a consolidation of American and European interests for the marketing of copper in Europe. Most of the quicksilver production has recently been placed in the hands of a syndicate for the coming year. Now comes rumor of a European aluminum cartel, with German, English, French, and Swiss producers represented; nothing is said about the Norwegian. For some time, of course, prices of some of the minor metals and minerals such as cadmium, bismuth, and sulphur have been closely supervised by controlling groups.

The aim of these organizations is, primarily, market stability. Violent ups and downs in prices will be discouraged. There is probably no intention to gouge the consumer, but, on the other hand, prices will be kept at a level that will assure the producers a profit. This may well be to the interest of the consumers as well as the producers of metal, for it takes much of the speculative risk out of their business. Little or no complaint is made in the United States, for instance, where aluminum and nickel production and prices have been stabilized by essentially monopolistic producers.

Unduly high prices arouse ill-feeling and discourage consumption. The item of competition with other metals is almost always present, too. The ultimate consumer will not buy an aluminum cooking vessel if its price is too high compared with tinplate or granite ware, and the large consumer will not buy aluminum for electrical purposes if it is more than twice the price of copper.

So long as the present laws are in force in the United States, the trend toward combination can only be made by purchase of one company by another, the leading examples of which, in the metal field, have recently been the maneuvers of Bethlehem Steel, of Anaconda, and of Kennecott. But metal markets are world markets, and what goes on abroad cannot but have an effect in America, an effect that shows promise of being a beneficent one for the mining industries. In Roosevelt's day, decentralization of industry was overdone; now, the pendulum is swinging back, and it may be that some time in the future, United States laws may be amended to allow more of what is going on abroad.

Our Sister on the South

MESSAGES sent to us from reliable quarters point out the increasing unrest in certain parts of the great territory of the Republic of Mexico—as, for example, in the Yaqui country, where the ever-restless warlike Yaqui Indians are, as usual, making trouble for the government. Some of these correspondents inquire why we take no editorial notice in these grave disturbances. They are reported in our news: we do not expatiate on them editorially for the same reason that we do not play up the recent machine-gunning of a United States mail car in New York, the lynching in Georgia, or the control of Herrin, Ill., by rival gangs of armed desperadoes, who attacked with machine guns the office of a United States marshal. We do not want Mexico to interfere to restore law and order in the United States, nor do we wish the United States to be unfriendly and annoying to Mexico.

It is well known that there are strong interests in the United States that would egg on this country toward difficulties with Mexico, including such measures as withdrawing diplomatic relations. Nothing would be more foolish, or more subversive of the cause of the world's progress. The State Department at Washington attacks Mexico as to her land laws: but it appears that the American interests actually involved are getting along pretty well. Wholesale anti-Mexico propaganda is directed by Church interests on account of the endeavor to secure a real separation of Church and State, a principle long recognized as necessary to good government. Our State Department accuses Mexico of meddling with the politics of Central America; the Mexican Government replies with similar charges. It is not clear whether the former charges are true; but of course, and as a matter of history and record, the latter are. The United States has controlled Nicaragua and dominated the Nicaraguan canal belt for many years; and her continued dominance is probably best for the world and surely for Nicaragua, which is in a continual state of petty and devastating warfare when United States marines are not in Managua or the United States Navy is not close to Nicaraguan ports. This dominance is as it should be: why dissemble so valiantly? Let the United States continue (as it will) to dominate Nicaragua and Costa Rica, as it has in the past, since this is also necessary to the safety of the Panama Canal, and all that implies for both the United States and Mexico: but let the United States support the upward struggles of Mexico for greater strength and order. On the other hand, if Mexico did not so ostentatiously overflow with affection for any country and people that happens at the moment to be unpopular at the time in the United States, the task of friendly Americans to back her up would be easier. Mutual helpfulness will arise most easily through wise and frank good-will on both sides.

Another Mistake Corrected

GREAT MEDICINAL VALUE has been claimed for the waters of certain springs on the ground that they are radioactive. This claim has always seemed extravagant, but has been difficult to disprove. Now a committee of the American Medical Association, according to the *Journal* of that body, has concluded not to accept any radium solution for internal use the dosage of which is less than two micrograms a day. "Can such therapeutic requirements be met by familiar natural waters?" asks the *Journal*. That they cannot it proceeds to demonstrate.

The investigation of W. D. Collins, a government expert, has shown that the radioactivity of the many waters in this country is for the most part only six-tenths of 1 per cent of the strength required to give the desired minimum dosage of two micrograms a day. A few exceptional samples have exhibited a strength some ten times greater but still far below the required minimum. Thus, of most waters one would have to drink from 100 to 1,000 gal. daily, instead of the single gallon which has been the usual daily dose. This is too much even for an ardent prohibitionist.

Petroleum Output Equals 1925 Record

SAVE FOR A SLIGHT RECESSION in 1924 the output of crude petroleum in the United States has mounted steadily since 1906. In that year production amounted to 126,500,000 bbl., a figure that seems ridiculously small beside the record output of 763,500,000 lb. in 1925. This increase in production has its parallel in the marvelous development of the automobile. In fact, by making cheap gasoline available the very condition of a too bounteous production of oil that has worked to the disadvantage of the oil producer has helped the manufacturer of motor cars in his effort to promote their use.

Whether the production curve in 1926 would continue on its upward trend beyond the point reached in 1925, or sag, or merely hold its own, was anybody's guess earlier in the year. Now, with production figures for ten and a half months available, it is possible to make an estimate that is reasonable and acceptable. This calculation indicates for 1926 an output of 763,000,000 bbl., which is practically the same as the record established in 1925. But there have been changes in the fields contributing to this total. Smackover's production, so potent last year as a record maker, will probably be some 27,000,000 bbl. less, though still important at 53,000,000 bbl. Various other fields will show decreased production, though in a minor way.

Offsetting these declines is the greatly increased or entirely new production of several fields. Principal among these factors have been the Texas Panhandle, with 16,500,000 bbl. of practically new production; the old Spindletop field, in the Gulf Coast region, which since June has suddenly increased its output by some 13,000,000 bbl.; the Wewoka and the Seminole pools, in Oklahoma; the Ventura Avenue field, in California; the Sunburst, in Montana; the Urania, in northern Louisiana; and the Lisbon field, in Arkansas, as well as the Mirando and Nigger Creek fields, in Texas, all of which are making important contributions to production, most of which oil is new.

Consumption of petroleum has increased in 1926, and, since imports and production have remained about the same as in 1925, with exports negligible at about 16,000,000 bbl., the net result will be a decrease in stocks of crude. Declining from about 338,500,000 bbl. on Dec. 31 last, it is likely that stocks will be reduced to some 300,000,000 bbl. by Jan. 1.

The output of 763,000,000 bbl. of oil seems huge. But if it be considered that this production will have come from 314,361 wells in 1926, which is practically correct, according to figures of the American Petroleum Institute, then it is seen that the year's output averaged

but 2,427 bbl. per productive well, or, taking the daily average, only 6.65 bbl. per well. Thus the petroleum situation assumes quite a different aspect, and it can readily be appreciated that the country's oil resources must be diminishing.

Mechanical Slaves and Their Masters

THE INVENTION AND USE of "mechanical slaves" having enabled the production of so much more goods per human worker than in the past, the worker has received proportionately higher wages. One cannot inspect the figures of gold production per man-shift in the Hollinger mine, for example, as given by Mr. Notman in his article in our issue of Nov. 13, and compare it with the man-shift output on the Rand, and deny that the Hollinger miner richly earns his high wage—sharing with his employer the rewards of the labor performed by the machines he operates. The standard of labor pay being thus set by machine operators, it is naturally, though without justification, extended to other laborers who do not operate machines—such as plumbers, carpenters, or jewelers, who work individually by hand in the old, old way, and do not turn out more work per man-shift than in the older days. The result is a general economizing by one and all in the services of these hand workers. It may be cheaper to buy a new watch than to have an old one cleaned and repaired; on a wholesale scale it is found cheaper and handier to dwell in scientifically skimped and conducted apartments rather than sustain the cost of repairs by high-priced, inefficient, special labor, and of the special high-priced and inefficient service. He who would live comfortably will flow with the trend of mass production; he who wishes an outlet for his surplus funds has only to demand a little of the old-time special labor. Comparative statistics show that hand work is expensive even in those countries where the wage is still cheap because there machinery has not set the scale: but in a country like the United States it is ruinous in cost; and this condition will be permanent and more accentuated.

The extensions and instances of this theme are too well known and too numerous to be detailed. In literature and the newspapers, even, one sees some of the same move toward economy through mass production and mass distribution which is evidenced by the chain stores. Chains of newspapers are also in fashion: the Scripps-Howard chain has just bought two leading Denver newspapers, making twenty-five in the chain. The printing machines, of course, tend to make all reading cheap where it was formerly perforce dear; and it is natural also that economy might be sought in the obtaining and purveying of news and of opinions.

In the face of this tendency, however, the cost of conducting high-class journals has increased, through the demand for special journalism and the consequent growth of specialized editorial staffs. Such a development is exemplified by *Engineering and Mining Journal*, which is a type of many. This resolute combating of the tendency of the times necessitates larger incomes for journals and the development of a more complex business enterprise—the increasing importance, in short, of journals like our own in the industrial, economic, and political life. Such publications represent the emergence of islands of individualism from the smoothly flowing tide of harnessed industrial and social conditions—islands progressively reduced in number as organization progresses, but which will always exist.

The World's Ups and Downs

NOT the least interesting phenomena to the student of rocks and ores are the evidences of up-and-down movements of great areas, with little attendant disturbance otherwise. The Atlantic Coast of North America shows deep indentations, like Chesapeake Bay and Delaware Bay, which represent the lower part of eroded river valleys, which lower portion has gradually sunk beneath sea level at no very remote geologic time. The Hudson River gorge can be followed by soundings far out beneath the sea, testifying to a sinking amounting to a thousand feet or more. Similar "drowned" river valleys occur further south, as on the eastern shore of Central America and of South America.

On the other hand, definite horizontal shore lines—"raised beaches"—may be traced on the New England coast up to a height of 600 ft. or so: they register uplift since the glacial period, and the different beaches at various levels testify to a spasmodically renewed, not regular, uplift. Similar excellent old beaches mark the littoral uplands of Scandinavia, Scotland, Alaska, Japan, the west coast of South America, and many other regions. These up-and-down movements are clearly far more rapid and far more frequent than those horizontal movements which result in folding of rocks; and as a rule they are so uniform that even faulting does not result therefrom. The cause of such great silent movements is not at all agreed upon; but evidently in the past they must have resulted in the submergence of the vast areas of habitable land, and on the other hand the reclaiming from the ocean bottom of vast tracts—and this even within the period of man's known sojourn on the globe.

The classic example of such movements is the temple of Jupiter Serapis, near Naples, in Italy, now standing with its base near sea level; at a height of about 20 ft. the columns are riddled with marine borers, showing that since its erection it has been submerged to that depth below the Mediterranean, and lifted up again. The initial subsidence is known to have taken place since 235 A.D.; and the later upward movement began before 1530 A.D. Since 1749 there has been a renewed subsidence, which ceased about 1852.

The Passing of Kemp

TO THE WORDS concerning James F. Kemp contributed to the last issue may properly be added an observation here. On the evening of Nov. 15 he sat at the side of the editor of this paper at a meeting of the New York Section of the A.I.M.E., and, as ever, won all hearers with his generous contribution of the major part of the evening's entertainment and instruction.

The ever-youthful sweetness of his spirit, his joy in life, his placid serenity were predominant as ever, side by side with the poised and trained mind which had made him distinguished. On the Wednesday morning following, he collapsed at a railway station, and so departed—a departure as ideal as his sojourn.

He was one of the most distinguished geologists and mining engineers of his time, and was easily the most loved. A strong and stalwart character, he had no ill-wishers. And he was fittingly recognized, so that his life was full: no one of his time and profession was so greatly honored by his colleagues and in so many ways.

Drilling With Detachable Bits at Anyox, B. C.

Success Attends Further Experimentation—Standard Cross Type Substituted for Single Cutting Edge—Great Saving Effected Where Cost of Nipping Is High

By William J. Coulter

Formerly Assistant Mine Superintendent, Granby Consolidated Mining, Smelting & Power Co., Anyox, B. C.

SINCE THE PUBLICATION of the article entitled "Experimenting with Detachable Bits at Anyox, B. C.," in the *Engineering and Mining Journal-Press* of March 28, 1925, considerable progress has been made and several important changes have been brought about that have decidedly improved the original bit, making it more practical and adaptable. The advance is described in this article with the belief that possibly some readers will be interested in following up Granby's experience in this field.

During the last year much thought and effort have been spent in trying to improve on the original design of the tapered socket and single bit, with the result that although nothing has proved more practical than the tapered socket and shank for retaining the bit, a decided improvement has been made through changing from the single bit to the standard cross bit. This change has contributed strongly to the success of these bits, and has made it practicable to increase the number of miners using them from sixteen to forty-six, so that they are now doing 60 per cent of the mine drilling.

The stock used in making the single bit was 2½x1-in. special bar steel and its price was the same as that of the ordinary 1¼-in. hollow round. The stock now used for making the new cross bit is the short and discarded pieces of mine steel that have previously gone to the scrap pile. Thus a substantial saving in the steel bill is effected.

As now used the bits are standard cross bits, which are made and sharpened in the usual way on a standard sharpening machine. In making a new bit, however, one additional operation is necessary. This consists in putting on the tapered shank and waterways, which is done in die 6 shown with that number in Fig. 1. These dies are set in the back of the sharpener on the opposite side from the swedging blocks (7 in Fig. 1). The procedure in making new bits from discarded scrap steel is as follows:

The short pieces, which vary in length from 1 ft. up, are first butt-welded on a Thompson No. 20 butt welding machine to make lengths of 5 to 6 ft., after which a new bit is made on this steel in the usual way, and at the same time the tapered shank is started in the forming block (8 in Fig. 1). The bit thus made is then cut off with the aid of a cutter on the side of the sharpener, and later it is reheated and the final forming of the shank as well as forging the waterways is done in die 6. No effort whatever is made to keep the hole in the center of the steel open, as the outside waterways are a means of supplying sufficient water. They also eliminated plugged steel. Occasionally a bit breaks in the shank, but this does not necessitate throwing it away, as it is the practice in such cases to pinch or draw out a new shank. Dull bits are sharpened in the usual way, but because of their shortness it is necessary to handle them with tongs. Although this may seem slow and awkward, in practice a steel sharpener without a helper heats and sharpens 300 bits per shift.

No change has been made in socket 2 (Fig. 1), which is made with a 4½-deg. taper with the dolly pin 3. It has been found that when the socket and shank of the bit are perfect a bit seldom works loose in the hole. It is therefore important to keep the dolly pin 3 and the shanking die 6 in first-class repair. In 2 in Fig. 1 it will be noticed that the bit does not seat against the face of the socket but that a portion of the tapered shank, about ⅜ in. long in a new steel, does not enter the socket. The idea in this case is to allow for a certain wear or expansion in the socket, which when taken up to a point where the shoulder becomes engaged with the socket will allow

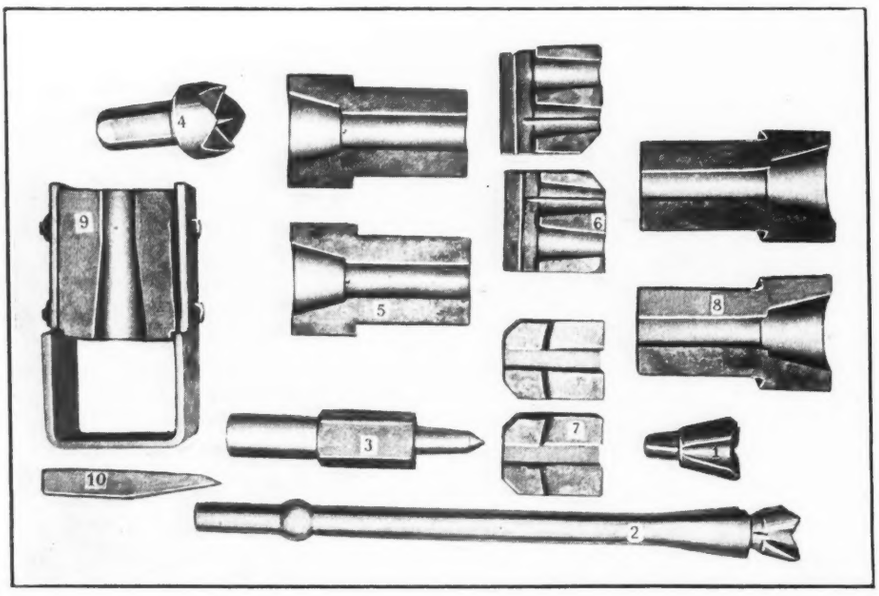


Fig. 1—Detachable cross bit developed at Anyox (1); also shown in steel socket in position for drilling (2), together with dies and tools used in forming and sharpening. See text

the sleeve to rotate on the shank and drop the bit in the hole. At this time it becomes necessary to take the shank out and reform it. The minimum outside diameter of the socket is $1\frac{7}{8}$ in.

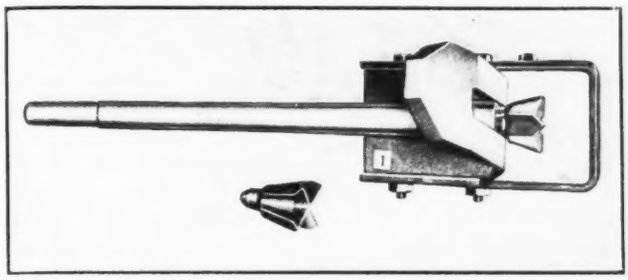


Fig. 2—Device used for extracting bit from socket, shown also in No. 9, Fig. 1

The depth of holes drilled with these bits ranges between 8 ft. and 20 ft., with an average depth of about 12 ft. Practically all of the work is done from either a bar or tripod, and though most of the drilling is of a sideswipe nature, down holes and uppers are commonly used. The starters have a gage of $2\frac{3}{4}$ in. and vary from this down to 2 in., with no regular gage changes between, and as the sharpening dollies are changed on eighths, a slightly ragged bit results. This trouble can be practically eliminated by using $\frac{1}{8}$ dolly changes.

In sorting the bits for distribution to the miners the nippers use a steel template which permits sorting to the nearest $\frac{1}{8}$ in., after which the sorted bits are placed in their proper compartments in a centrally located bit box on each level. It is then a simple matter to pick out sets as required or any particular gage wanted. Dull bits taken into the shop are similarly gaged, and put into proper bins, which is not only an aid to the sharpener but adds to the general appearance in this part of the steel shop. To avoid losing bits underground, the nippers are held responsible for returning as many as are given out, and are provided with printed forms upon which a daily report is turned in from all work places. The daily turnover now runs close to 800 bits.

The making of new bits requires two heats and takes about twice as long as straight sharpening. One sharpener and a helper will turn out around 200 per shift, and the total cost of each bit is about 12½c. where there is no cost for material. Most of the original new bits are made up in starter sizes and through use and resharpening gradually wear themselves down to finishers after an average life of fifteen to twenty sharpenings. Although every effort is made to keep the bit loss as low as possible, it is in reality not as serious as it might appear in that we have found that it costs twice the value of one bit to take a mine steel through the cycle of sharpening and distributing. Thus a comfortable margin is left.

Advantages of Detachable Cross Bit

In these detachable bits, as in regular mine steel, it has been found that the cross bit has all the recognized advantages over a single bit, and that most of the advantages are emphasized, recognition of which has had much to do with their extended use and increased efficiency. Some of the advantages that have been particularly noted follow: (1) They are not subject to the general prejudice that existed against the single bit. (2) They afford faster drilling speed by 10 to 15 per cent. (3) Their use eliminates "Dutchmen," which has reduced broken shanks in the hole by 75 per cent and bits working loose in the socket to about the same extent. (4) Machine repair costs are lower, due to less strain on the rotation parts. (5) With them it is much easier to collar a hole, especially on a sloping face. (6) Their field of usefulness has been extended to hard rock. (7) Steel costs are materially reduced. (8) Their use has made a big saving possible in nipping costs. Most of these advantages are self-explanatory, but it is well to state that prior to using the bits, although each machine was operated by one man only, the nippers employed came to .7 per miner, due to the scattered workings and long trails in open stopes. Now one nipper looks after six machines, not only supplying sharp bits and taking out dull ones, but also helping in setting up and tearing down. Again, under the old system it was common to see excessive accumulations of certain lengths of steel, generally in different working places, and a considerable number were lost in the muck. In using the bits here described, it is necessary to have only one additional set of steel in a stope, which naturally results in better care being taken of the steel. This is accompanied with a proportional saving in the number of steel lost.

The drilling of extremely hard rock, where it may be impossible to get more than 3 in. per sharpening out of the ordinary mine steel, put the bit shanks and the sockets to a severe test. The socket is prone to expand under such conditions to such an extent that it drops the bits and requires frequent reforming. Such drilling places, however, are not common. It has been found best in these instances to use ordinary mine steel, especially in places where 20-ft. holes are required. At Anyox it is thought that the use of the bits can ultimately be extended to cover 75 to 85 per cent of the drilling, which will make it necessary to continue using a small amount of the regular steel. In drilling hard rock the fact that the bits have no definite gage has proved to be an advantage, in that it is possible to select a bit that will follow, and it has helped to minimize trouble from oversized steel.

Plugged Steel Avoided

With the waterways in the sides of the bits and back from the cutting face, no trouble whatever is experienced with plugged steel, which is another point in favor of the bits. New bits stamped from solid steel would undoubtedly give better service, in that the section would not be weakened by the hole in the center, in addition to which one would not have fatigued steel to deal with. As the breakage, however, runs less than 10 per cent, it is a question whether it would pay to use new steel or not when the extra cost of material is considered.

Extracting the Bit

In Fig. 1, No. 9 shows a type of bit extractor that is different from the one originally used. The idea in this was to get away from driving the wedge between the bit and socket as was done with the old style of bit where both were supported on the same plane with the slot between. During this operation most of the bit shanks were broken, in much the same manner as might be expected from striking them a direct blow on an anvil. In the new design no support was provided for the bit, which allowed a certain amount of spring from a blow on the wedge. The strap in front was designed to be used as

a handle, but more particularly used to stop flying bits. It was also found that in most cases where a shank broke off in the socket, a sharp blow on the socket would cause the broken shank to spring out, and the slot in the new extractor was provided as a place for this operation. The most serious objection to the new block is that instead of occasionally hammering the sockets to remove a broken shank, it has become a common practice to remove bits in the same way, which has naturally had a bad effect on both the bits and sockets. This has led to the design of another extractor which combines the good points of the former blocks and will be very similar to the original extractor. It will, however, be made of cast steel instead of cast iron; the slot below the bit will be recessed deeper than the slot below the socket, and on one side a grove will be provided for removing broken shanks. With the wedge chained to the extractor there will then be no excuse for "bumping" the bits.

Substantial Savings Effected

Mining methods and mining conditions at Anyox are such that these detachable bits have filled drilling requirements in a practical and efficient manner and have been the means of making a substantial saving in drilling and breaking costs. To many the fact that the company uses a 2¾-in. starter and finishes at 2 in. would in itself condemn the idea of even giving the bits a trial. At Anyox, however, they permit the drilling of 12- to 20-ft. holes, and because of their diameter allow a heavier charge of powder at the bottom of the hole, which works directly toward increasing the load on each hole and a correspondingly larger tonnage per hole drilled. For shorter holes of say 10 ft. and in fair drilling ground the starter and second bits are not used, but in extremely hard rock these have proved helpful in getting the hole down.

An appreciable saving has been made in steel consumption through eliminating loss in the muck, but the most important saving comes in the nipping of steel, which in the past has been expensive because of distant and scattered workings. Where holes not deeper than 6 to 8 ft. are required, and the ground is good for drilling, it is possible that the objection to the large hole could be overcome by standardizing on 1-in. hollow-round steel and using ⅛-in. gage changes, which would make the starter around 1¾ in. and the finisher 1⅜ in.

After two years of continued experimenting and use, the practicability of this type of detachable bit has proved itself beyond question at Anyox. The simplicity of the bit and socket and the fact that all shop work connected with them can be done on any standard sharpening machine, at a very small initial expense, would in my opinion justify giving them a trial, where the cost of mine steel and nipping are excessively expensive items.

Antimony Reserves Unknown

Antimony is found in many localities throughout the world, states the U. S. Bureau of Mines in a recently issued report. Little is known as to the actual world resources, as heretofore the supply has met the demand with ease and resources have never been taxed to their maximum capacity. For many years France was the only country requiring any considerable quantity of antimony that obtained it from her domestic deposits; but with the economic exhaustion of La Lucette mine, in the Province of Mayenne, production in France has virtually ceased. Some of the needs of France are now supplied by Algeria (French owned). From what is now known of the resources of the British Empire, Burma is the only country that may supply a material part of Great Britain's consumption, and at a price greater than has heretofore been reached. The inaccessibility of the Burmese deposits makes them non-commercial at present.

Among the countries that utilize a large share of the world's output, the United States, Germany, Japan, Spain, and Italy do not contain deposits of antimony of such size as to be of commercial importance. Of the deposits now developed, those of China, Bolivia, and Mexico are large enough to guarantee the world's present annual consumption for many years. Of these countries China occupies the strategic position through ability to control, within limits, the world's output as well as the price. The very nature of the uses of antimony renders the maintaining of a high price for the metal extremely difficult, if not impossible. High prices mean substitution and curtailment of consumption; also when the price of antimony is in excess of 15 to 17c. per pound (New York quotation), Bolivia and Mexico begin to produce the metal and thus create a surplus that inevitably results in lower prices.

Geological Survey's Work Summarized

During the last year, the U. S. Geological Survey made geologic surveys in forty-three states and in the District of Columbia, according to the annual report of the Department of the Interior. This work included geologic mapping, determination of stratigraphy, structure and geologic history, and examination of mineral resources. It co-operated with eight states in geologic work and continued detailed geologic mapping of the coal fields of public land states, preparing reports showing the outcropping, thickness, quality of coal, and estimates of available tonnage.

Eight field parties were maintained in Alaska during the field season. The Bureau also took over by transfer from the Bureau of Mines the supervision of the production of coal and oil on public lands in Alaska as well as the supervision of mine safety. The report shows that 227,036 books, 8,949 geologic folios, and 760,346 maps of the Geological Survey were distributed during the year, of which 637,779 maps and folios were sold for $47,840.86.

Oil Output in Canada Doubled

Crude petroleum produced in Canada during 1925 totaled 332,001 bbl., with a valuation of $1,250,705, according to finally revised statistics issued by the Dominion Bureau of Statistics at Ottawa. The previous year's production amounted to 160,773 bbl., worth $467,400. Alberta's production, mainly from the Royalite No. 4 wet gas well, reached a new high mark for the province —namely, 183,491 bbl. Ontario ranked second with a production of 143,134 bbl.; the remainder, or 5,376 bbl., came from the Stony Creek field, in New Brunswick. Petroleum wells in operation during 1925 numbered 2,885.

Manitoba: A Potential Canadian Mining Area

Formerly Considered as Agricultural Country Only — Geological Exploration Began About 1873 — Gold and Copper Predominant Economic Minerals

By Harold P. Prather
233 Yale Ave., Winnipeg, Manitoba

IN A REVIEW of mining in Manitoba, one is impressed by the fact that while there are no established producing mining camps, there are some excellent mineralized areas in which prospecting and development are being actively pursued that give good promise of becoming the nucleus of real mining districts.

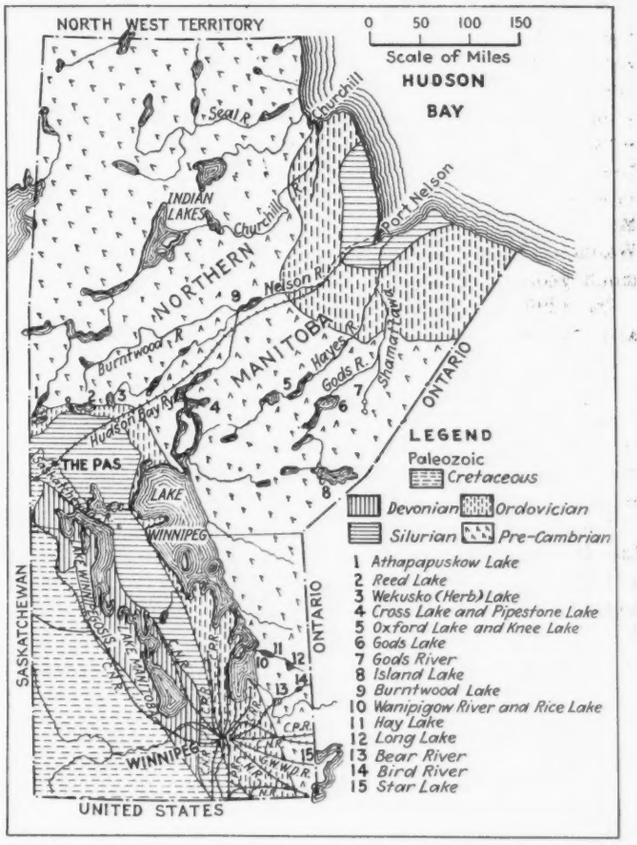
The producing districts of Ontario and the potential districts of Manitoba have the same genesis in the mineral-bearing Pre-Cambrian shield, which comprises the greater part of the total area of Manitoba. The exploitation of Manitoba's mineral resources has not been attended by the auspicious circumstances which assisted the growth of this industry in Ontario. Many reasons have been advanced to account for the slow development.

Failure of the Lake of the Woods and Rainy River districts of northwestern Ontario to develop a profitable mine undoubtedly prejudiced mining interests against Central Canadian fields in general, although now the Foley mine, at Mine Center, in the Rainy River district, is considered as a proven property and an imminent producer. The Eagle Star mine, at Eagle River, in the Dryden district, is about to undertake extensive development, but it took over a quarter of a century to bring about these conditions.

Staking of mining claims by the one-line method, under Manitoba regulations, led to rapid blanketing of promising formations with little initial outlay on the part of locators, who trusted to dispose of their ground before assessment time expired, and when assessment work was necessary to keep claims in good standing its nature was to conform to the essence of the law rather than to explore the properties and define the extent of mineralization. In general, the ease with which mining claims could be held at nominal cost did not encourage operating companies and syndicates to investigate minable acreages. In many cases "discoveries" only, with practically no prospecting work at all, were held at ridiculous sale prices, entirely unwarranted in the absence of a "boom" to stimulate prices. To circumvent this situation operating companies have put salaried staff prospectors into the fields, instead of trying to deal with the multitude of locators.

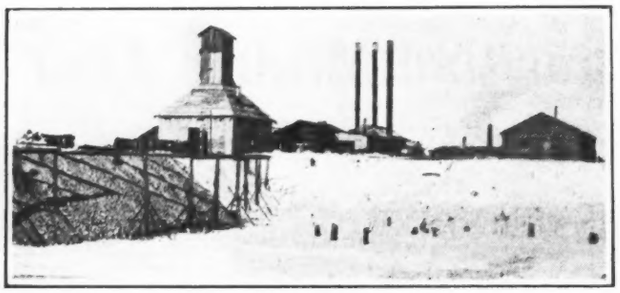
Local financial background has not been what it might have been. A flurry of interest created by a small and short-lived campaign to finance some Rice Lake properties, in 1919, is still incorrectly referred to as a "boom," but the involved properties got such a poor start that it was not long before they found themselves in the age-old position of trying to reconcile discouraged shareholders with failure to produce a mine, and the consequent stopping of activities.

Primarily founded and built upon grain farming and marketing, the financial interests of Manitoba have been slow in appreciation of the potential possibilities of a mining industry and reticent to divert capital to mining enterprises. It is not out of the way to state that had not local capital been so indifferent to mining possibilities, and had it given mining the support that it merited, the stage of development of the industry today would be much farther advanced than it is in Manitoba. More recently the fiasco of the Bingo mine, in northern Manitoba, depreciated confidence in the country in general, although the failure of this property to stand up under expert examination was not a surprise in mining circles.



Geological sketch map of Manitoba

Lack of transportation and power has also been a severe handicap, and there has not been the important co-operation afforded by the government, which has been so helpful to Ontario's mining camps. This is partly explained by the fact that the mineral resources of Manitoba are not controlled by the Manitoba provincial government, but by the Dominion government. However, where metalliferous ores are to be found there will be prospectors, and in this adventurous calling Manitoba has had a fair share, and today there is just as much exploring activity in Manitoba as in the new "Red Lake" district of Ontario, or more, with better disclosures and far easier access than this Ontario "Klondike."



Central Manitoba Mines, Ltd., main shaft, February, 1926

It would be difficult to establish just when prospecting activities began in Manitoba—that is, if the observations of early explorers, who traversed the country tributary to the Saskatchewan River and Lake Winnipeg in the later part of the eighteenth century and early nineteenth century, are to be considered original discoveries. Many of these men recorded their observations of isolated instances of geological formations in what is now Manitoba, and since about 1873 there have been systematic surveys, largely under government supervision. J. B. Tyrrell, D. B. Dowling, William McInnes, E. L. Bruce, F. J. Alcock, J. F. Wright, R. C. Wallace, J. S. DeLury, and others have contributed much geological data.

In 1896 a gold claim was staked at Reed Lake, and between 1908 and 1913 active prospecting was carried on, particularly in the northern area of Manitoba. Attention was drawn to Manitoba following discovery of gold deposits in the Pre-Cambrian rocks of northern Ontario, and in August, 1913, free gold-bearing veins were discovered at Amisk Lake, in Saskatchewan, just west of the Manitoba boundary.

The Manitoba geological column is not complete, but the formations represented are: (1) Pre-Cambrian; (2) Ordovician, Silurian and Devonian; (3) Cretaceous and early Eocene, and (4) Pleistocene and Recent. The first of these groups is dominantly igneous, the second limestones and dolomites, the third shales, and the fourth clays, sands and lake deposits. These represent four time intervals in the geological history of Manitoba, with the Pre-Cambrian the longest in time value and the most important as being the mineral-bearing source of present-day exploration. Both igneous and sedimentary rocks have been considerably metamorphosed.

Pre-Cambrian Rocks Predominant

Pre-Cambrian rocks are exposed in the eastern and northern parts of Manitoba, and form three-fifths of the surface area of the province. West of Lake Winnipeg they are overlain by younger sediments and immediately west of Hudson Bay by sediments of Paleozoic age. The western boundary extends from the southeast corner of Manitoba northwestward to Lake Winnipeg, which is an erosion lake between the Pre-Cambrian and overlying limestone, from the north end of Lake Winnipeg to the Grass River, following to its source, thence along the south side of Athapapuskow Lake to the western boundary of Manitoba.

The Pre-Cambrian is the most complicated of the geological formations. Only a few areas have been mapped in detail and it is not possible to correlate satisfactorily the results from the different fields. Work done in the mining districts of Ontario has assisted in interpreting problems of Canadian Pre-Cambrian geology as a whole.

At first it was believed that the granites and gneisses formed the Pre-Cambrian basement, but A. C. Lawson[1] established that there was an older greenstone, designated "Keewatin," into which the Laurentian granites had been intruded. It has also been established that much of the granite which had been considered to be of Laurentian age was really younger, as a result of a later period of orogenic activity, designated "Algoman." Associated with this later granite are gabbros, norites and lamprophyre dikes.

The present practice is to propose purely local Pre-Cambrian classifications for each particular district and not try to correlate these classifications. However, the accompanying table is submitted, as tentatively proposed by Prof. R. C. Wallace.[2] Emphasis is on time sequence, not on correlation with terminology current elsewhere.

Granite intrusions. Gabbro intrusions. Lamprophyre dikes.	Algoman (?)
Arkose, conglomerates with large jasper pebbles.	
Minor unconformity.	
Quartzites, slates and greywackes. Conglomerates with pebbles, mainly of granite, aplite and felsite.	Temiskamian (?)
Erosional unconformity.	
Lit-par-lit intrusions of granite, now gneissose.	Laurentian (?)
Basic and acid lavas with basal and interbedded sediments.	Keewatin and Coutchiching (?)

Detailed geological work has been done in Manitoba in the areas which are of economic significance on account of the mineral deposits which they contain. Among these are the area north of The Pas, from the Manitoba-Saskatchewan boundary near Schist Lake east to Wekusko Lake; the area east of Lake Winnipeg from Wanipigow River south to Lac du Bonnet; and to a lesser extent the Cross Lake and Pipestone Lake area, the Oxford Lake and Knee Lake area, the Nelson House and South Indian Lake area, the lower Churchill River area, and the area between the Whitemouth River and Winnipeg River south to Star Lake and Falcon Lake. Elaborate geological details and information regarding the areas mentioned have been published.[3]

Gold Associated With Algoman Granites

The Algoman granites have been responsible for the introduction of gold in quartz veins and shear zones, particularly in the sheared lavas of Laurentian age. The eastern Manitoba gold district is occupied by a series of Keewatin volcanics with associated sediments, schists and gneisses, the area occupied by these rocks being bounded by and invaded by granitic rocks ranging from granite to granodiorite and syenite. Later dikes of porphyry cut the granites and the complex of volcanics and sediments. The gold deposits consist of lenticular bodies in which quartz partly replaces the country rock and partly fills fractures in the volcanics, sediments or granitic intrusives. The lenses of ore oc-

[1]Annual Report, Canadian Geological Survey, 1885, Part cc. pp. 5-140.

[2]The Geological Formations of Manitoba, by R. C. Wallace.

[3]The Mineral Resources of Manitoba, by R. C. Wallace, issued by the Industrial Development Board of Manitoba. Geology and Economic Minerals of Canada, by G. A. Young, Geological Survey, Department of Mines, Canada. Bulletins Nos. 1716 (E. L. Bruce), 1821 (F. J. Alcock), 1947 (H. C. Cooke), 1999 (F. J. Alcock, F. Armstrong, J. F. Wright), 2035 (J. F. Wright), 2077 (J. F. Wright), being reports of field geological work in some of the areas mentioned.

cur in fractured or sheared zones which are irregular in length and width, and generally parallel with and close to the granite contact, more particularly where tongue-like masses of a granodiorite phase project into the schists. In places the quartz is mineralized with pyrite, chalcopyrite, arsenopyrite, sphalerite and galena, with which the gold is associated. Gold tellurides occur in some places.

Gold-bearing deposits also occur in the northern Manitoba area. In this area are a complex of volcanics and altered sediments, invaded by granitic rocks. The gold deposits are quartz veins, traversing all the rock varieties, including the latest granites. In many cases the veins contain considerable feldspar varying from pegmatites to quartz veins. Tourmaline is abundant in many veins and arsenopyrite is present in most of them. In the Reed-Wekusko lakes area, to the east end of the general area, the auriferous veins are mostly in the old volcanics close to granite contacts. Most of the veins are lenticular and many follow planes of bedding or schistosity. In many cases the quartz veins are barren. In the auriferous veins pyrite, chalcopyrite, galena and sphalerite are frequently found. In most cases the vein walls are sharply defined, but in some cases the wall rock is impregnated with sulphides and carbonates.

Similar deposits occur at the west end of the general northern area, in the Amisk and Athapapuskow Lake area, but in Elbow Lake area true veins do not occur, the deposits being lenticular. Gold is also found in Star Lake and Falcon Lake areas, in southeastern Manitoba, west of Lake of the Woods.

The first recorded gold production from Manitoba was in 1917, since when the total output has been about $100,000, most of which came from the copper-gold ore in northern Manitoba.

From the same series of granites, sulphides of copper, iron, lead and zinc have invaded and metasomatically replaced greenstone in shear zones and drag faults in Schist Lake-Athapapuskow lake area. In this district two important orebodies, the Mandy and the Flin Flon, and a number of minor occurrences of copper have been found. The district is occupied by a complex of various altered volcanics and sediments invaded by granite. Nearly 10,000,000 lb. of copper was obtained from a single orebody in the Flin Flon area between 1917 and 1920.

Sulphides of copper and nickel are associated with the granites and gabbros in the Maskwa River-Oiseau Lake areas, and scheelite and molybdenite are associated with pegmatites in the Star Lake area. Banded hematite and magnetite occur in the sediments which are grouped under the Keewatin, but are not of economic importance.

Winnipeg's Strategic Position

Winnipeg occupies the key position in relation to the Manitoba mining fields, possessing complete banking, commercial and industrial facilities, as well as being the logical point of origin for access to any of the areas, excepting the northern district, which is reached from The Pas, although for this northern area, too, Winnipeg bears the same relation as Toronto does to northern Ontario districts.

The Amisk-Athapapuskow lake district of the northern area is most easily reached from The Pas, Manitoba. During the summer months the Saskatchewan River may be ascended to Cumberland House and across Cumberland and Namew lakes to the mouth of the Sturgeon-Weir River. From Shining Bay a team road leads to Amisk Lake, or it can be reached via the Sturgeon-Weir River, but rapids detract from this route. From Namew Lake a 17-mile wagon road leads to South Bay of Athapapuskow Lake, or the Goose River and Goose Lake can be used, but the river contains many rapids.

The general elevation is about 1,000 ft. above sea level. Flat-lying Paleozoic rocks underlie the southern part of the district, which is fairly level, but in the northern part the complex of Pre-Cambrian rocks give an uneven relief, granite batholiths forming resistant bluffs and stream divides.

Gold and Copper Minerals Predominate

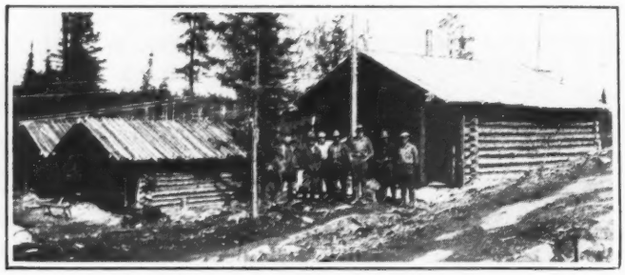
There are two kinds of metalliferous mineral deposits in the Amisk Lake area: gold-bearing quartz veins, and chalcopyrite-sphalerite replacements carrying low gold and silver values. Both types are believed to be genetically related to the granite batholiths and their mineralogical difference due to conditions under which they were deposited, the gold-bearing quartz veins being formed under high pressure and temperature at depth, the sulphide ores under less extreme conditions. So far no commercial ores have been developed in the quartz veins. Instances of rich specimens are common enough, but most of the veins are low grade. Many sulphide bodies are found along the contacts of granite intrusions with greenstone and schist. These lenses are chiefly pyrrhotite or pyrite.

In the summer of 1915 the Flin Flon orebody on Flin Flon Lake was staked and in the autumn of the same year the Mandy property was located. J. E. Spurr, with a party of engineers, was on his way to inspect the newly discovered Flin Flon property; he noticed the signs of the Mandy orebody on the shore of Schist Lake, and requested Jackson, a civil engineer accompanying the party, to return the next day and investigate. This resulted in the discovery, and the location of the claims.

The Mandy orebody occurs in a zone of sheared, schistose volcanics flanked by massive greenstone, and forms an irregular lens measuring 225 ft. by 40 ft., with its longer axis parallel to the strike of the schists. An inner lens, situated toward one side of the main body, consisted largely of chalcopyrite and afforded about 25,000 tons of ore with an average copper content of 20 per cent. This mass of richer ore had a length of 100 ft., a maximum width of 18 ft., and extended to a depth of 200 ft. It was composed of chalcopyrite and

Cryderman shaft, power house and water tank, May, 1926

minute rock fragments impregnated with pyrite. The inner lens merged into and was surrounded by leaner ore which still remains unmined, and consists of the same sulphides as formed the inner body. The outer portion carries pyrite as the chief sulphide and this pyrite-rich zone grades outward into the country rock impregnated with sulphides. In places the ore is roughly banded, due to the presence of alternate zones each characterized by the predominance of one or more sulphides. The orebody was formed by replacing country rock, and apparently deposition of pyrite predominated



Cryderman office and bunk houses

in the earlier stages of growth of the ore occurrence, whereas the formation of chalcopyrite characterized the closing stages.

The Mandy orebody was not large enough to warrant the erection of a smelter, but after the Tonopah Mining Co., in 1916, under the direction of J. E. Spurr had blocked out by diamond drilling an orebody of 25,000 tons of massive chalcopyrite averaging about 20 per cent copper, with additional gold and silver values of about $5 per ton, and about 180,000 tons of lower grade mixed copper, iron, and zinc sulphides, assaying from 5 to 8 per cent copper, 20 to 30 per cent zinc, and $5 gold and silver per ton, the war-time price of copper was inducement to undertake mining operations. From 1917 to 1920 inclusive 25,000 tons of high-grade ore was hauled, by team, barge and railroad, via The Pas, to the smelter at Trail, B. C. It was a huge undertaking to transport the ore, employing 300 teams of horses, four steamboats and seven barges to make the 150-mile trip from the mine to railhead at The Pas. The amount of copper recovered was 9,866,328 lb., valued at $2,039,943. In addition the ore averaged $5 in gold and silver per ton.

Another copper deposit, the Flin Flon, occurs three and a half miles northwest of the Mandy. The developed orebody is in greenstone, and has a length at the surface of nearly 2,600 ft. and a maximum breadth of 400 ft. The orebody, with decreasing cross-section, extends to a depth of at least 900 ft., where its length is 1,000 ft. and its breadth 35 ft. Within this lens-shaped mass there are several bands of mineralized rock, but making allowances for such material, it has been calculated that there are over 16,000,000 tons of ore averaging 1.68 per cent copper, 3.49 per cent zinc, 0.074 oz. gold, and 1.04 oz. silver per ton. The ore consists essentially of pyrite, sphalerite, chalcopyrite and country rock of chlorite schist. These sulphides form the central part of the orebody. The remainder of the orebody consists of schist impregnated with sulphides, forming the disseminated sulphide type. The ore was formed by the replacement of schistose rock, and it is notable that the large masses of barren rock occurring within the body and also the country rock away from the deposit are massive.

The Flin Flon orebody has been blocked out by diamond drilling and underground development, but no commercial quantities of ore have been produced. Forty-four holes were drilled, a total of 25,664 ft. Two shafts have been sunk on the orebody 500 ft. apart, one to a depth of 210 ft., from which level a drift 266 ft. in length was driven, and a crosscut to the north for 318 ft. and another to the south for 245 ft. The other shaft was sunk to a depth of 304 ft., and from it a crosscut was driven for 160 ft. on the 100-ft. level and another 173 ft. on the 300-ft. level. This work confirmed the drilling results both as regards tonnage and values.

The exploration and development of the Flin Flon has been undertaken by several interests. In May, 1921, the Mining Corporation of Canada bought a majority interest in the property and proceeded to search for more ore deposits in the vicinity and for siliceous flux material. It is now under option to H. P. Whitney and associates, of New York, who have been making metallurgical tests upon the ore at Denver, Col., which, if successful, will result in mining operations being commenced. It is now reported (Aug. 14) that those holding the option are about to implement the terms of their option and construct a pilot smelter, negotiations having been begun for building about 90 miles of railroad and orders placed for machinery, fuel and supplies to be delivered to the property.

KISSISSING LAKE COPPER DEPOSITS

At Kississing Lake, 35 miles northeast of the Flin Flon, commencing in February, 1926, officials of the Nipissing Mines Co. privately operated two diamond drills in testing out what is known as the Sherritt-Madole property and are reported to have proved up some 6,000,000 tons of sulphide ore, assaying from 6 to 8 per cent copper, 15 to 34 per cent zinc, gold values around $6 and silver about $3. The property consists of fifty-two claims of approximately 2,600 acres, and is 73 miles from Mile 7 on the Hudson Bay Railway, out of The Pas. According to J. P. Gordon, of The Pas, who interested the optionees, "the ore is not deposited in lenticular formation, but occurs as a replacement in a major fissure in Kisenew gneiss." Prof. R. C. Wallace was recently at Kississing Lake and will no doubt have more information concerning this deposit.

To mine the sulphide orebodies of this area profitably, a railway, smelter and electric power will be necessary. The ore presents a metallurgical problem in zinc recovery and an absence of silica flux. The absence of silica flux has been partly solved by the acquisition, in the case of the Mining Corporation, of the Rex mine on Wekusko Lake, to the east, a gold-bearing quartz property.

ELBOW LAKE AREA

Some attention was attracted in 1921 to discoveries of gold ore on Elbow Lake, in the northeast section of the Athapapuskow Lake region, but failure to prove up any commercial ore caused interest to lapse. This area offers no example of true fissure vein. The deposits in the Murray discovery claims (taken under option and explored in 1921 by interests identified with the Hollinger mine) occur in a quartzitic folded and sheared gneiss. Numerous tension cracks also occur filled with vein matter, but are too widely spaced and irregularly disposed to be considered a shear zone. In this area the Webb Mining Co. is at present carrying on some

development work, the results of which have not yet been conclusive.

The Reed Lake-Webusko Lake district of the northern area is reached from Mile 82 on the Hudson Bay Railway, from where an 11-mile wagon road leads to Wekusko Lake. Gold-bearing quartz veins were first discovered on Wekusko Lake in 1914.

The greater part of the area is underlain by Pre-Cambrian rocks, but a belt of Paleozoic dolomite about 8 miles wide extends across the southern part. The Pre-Cambrian complex consists of igneous and sedimentary rocks intruded by granite and granitic gneiss. The quartz veins traverse all the rocks of the district except the Ordovician dolomite, and are believed to be high-temperature deposits genetically related to the granitic intrusions.

The Rex mine, on Wekusko Lake, has been operated by the Mining Corporation of Canada with the idea that it might be developed into a source of some gold-bearing silica flux to be used in connection with future smelting operations at the Flin Flon. Gold to the value of about $42,000 was extracted from ore resulting from this development work only. On another property near Wekusko Lake this company also recovered by simple amalgamation $23,471 in gold from 2,669 tons of ore.

The geology of the Rex property may be briefly described as an interbanded series of sediments and acid volcanics intruded by lamprophyre dikes. The vein lies in rhyolite near its western contact with a quartzite band, and follows the strike of the formation.

Another property in this area is the Bingo Mines, Ltd., upon which development work was undertaken, mostly by English capital. J. A. Dresser reported at length on this property, which report was quoted in the *Engineering and Mining Journal-Press*, May 2, 1925. Following two civil lawsuits, resulting from discord within the company, hinged largely on this report, Joseph Myers, since deceased, undertook to install an experimental mill on the property to mill the ore accumulated on the dump from development work, and possibly to disprove the technical opinions which were adverse to his contentions. No other properties in this area are beyond the prospect stage, although spectacular free-gold specimens are found in many instances.

Burntwood and Pipestone Lake Area

The Burntwood Lake, Cross Lake and Pipestone Lake, Oxford Lake and Knee Lake, Gods Lake and River, and Island Lake sections are still in the prospect stage. In general they are inaccessible for development, and although discoveries have been made which are interesting, until some form of adequate transportation is provided not much can be expected in the way of mining. Recently (July), rumors of important discoveries at Oxford Lake have been heard and quite a few prospectors are undertaking the difficult trek to this section with the usual prospector's unfailing optimism.

The eastern Manitoba area has been referred to as the Rice Lake area, central Manitoba area, and other appelations, but for the purpose of this article the eastern Manitoba area is taken as embracing the territory east of Lake Winnipeg to the Ontario boundary from the mineralized district just north of the Wanipigow River south to and including the copper-nickel and lithia deposits in the neighborhood of the Winnipeg River.

This eastern Manitoba area is really divided into two belts, the northern gold-bearing belt being a zone approximately 10 miles wide and 50 miles long lying generally parallel to the Manigotagan River, and the southern copper-nickel-bearing belt being a zone roughly 15 miles wide and 30 miles long lying generally parallel to the Oiseau River, and adjacent to the Winnipeg River.

Three routes of travel have been established to reach the different sections of this area. To reach the gold properties of the northern part the best summer route is by railroad to Riverton, on the west side of Lake Winnipeg, then by motor boat across the lake to either the Wanipigow or Manigotagan river; or a boat can be taken direct from Winnipeg down the Red River and across Lake Winnipeg. Either the Wanipigow or Manigotagan river may be ascended, the Wanipigow affording the easiest travel because of new government highways between points and less portaging, to English Brook, Long Lake, Bulldog Lake, Halfway Lake, Rice Lake, Moore Lake, Garner Lake, Beresford Lake, and other lakes, which names are used for easier facility in locating properties in the absence of government surveyed townships. During the winter the route is by railroad to the railhead at Great Falls, on the Winnipeg River, and then by sleigh road direct to the operating properties.

To reach the southern part, the route is by railroad to Lac du Bonnet, and thence by motor boat and canoe to the various camps on the Winnipeg and Oiseau rivers. The northern part can be reached this way also, by a system of lakes and portages, but it is not generally favored. The distance to any part of the area from Winnipeg is about 100 miles, and travel is more inconvenient than uncomfortable because, aside from portaging, the routes are relatively better than would be anticipated in an undeveloped country.

The topography is similar to most areas of Pre-Cambrian formation, in having rugged but low relief. The district between the northern and southern belts is largely muskeg and spruce swamps. The low hills of the northern belt are elongated in a west-northwest direction. Bed-rock is fairly well exposed, but outcrops of sedimentary and volcanic contacts are few. Glaciation evidence is abundant, smoothed and striated rock surfaces being prominent.

The gold-quartz deposits of the northern belt are vein fillings and replacements in belts of schist, the principal veins being found in shear zones that cut through the older rocks to contacts with granite. It is generally concluded that the vein materials were deposited from solutions emanating from granite intrusives, because the veins gradually decrease in size with distance from the granite contacts, with varied composition to indicate deposition from hot concentrated solutions close to the granite, and from cool dilute solutions at a distance. The gold-quartz outcrops as lenses which partly replace country rock and fill fracture planes in the volcanic and interbedded sedimentary rocks and in the granite intrusives. These shear zones are irregular, pinching and swelling, and are only partly replaced with quartz, sulphides and gold, which represent a residual magma or residual solutions from the granitic magma that concentrated along these local fracture and shear zones. The deposits of greatest known economic importance occur within or near the contact of the coarse-grained, massive, dioritic phases of the granitic intrusives.

Several thousand mining claims have been staked in

this belt, with varying amounts of exploration and development work, from the barest assessment requirements to extensive underground development and small production of gold.

First Claim Staked in 1911

The first claim staked in this district was the Gabrielle, north of Rice Lake, staked in March, 1911, upon which a shaft was sunk but no large body of workable quartz found. The formation on this claim is fractured diabase, impregnated with quartz, pyrite and some siderite. A contestant for first discovery honors is the San Antonio, adjacent to the Gabrielle, where by means of an open cut, pits and trenches a quartz vein 5 ft. wide was exposed, in fractured diabase.

The pioneer property to undertake underground development on a comprehensive scale is the Luleo group, by the Selkirk Gold Mining Co. This property is about 6 miles west of Wanipigow Lake and 1½ miles north of Wanipigow River. Outcropping rocks are massive granite porphyry and granodiorite cut by diabase dikes, and contain many schist inclusions. This property has a shaft 325 ft. deep in the footwall of the shear zone, with crosscuts and drifts at the 125-ft. and 325-ft. levels, which have disclosed the irregular nature of the formation. The drifts are in quartz, schist impregnated with quartz, and schistose granitic rocks. Quartz is the principal gangue and the mineralization consists of sulphides, mostly pyrite and disseminated specks of gold. Free gold occurs throughout the white quartz or as thin films in cracks in this quartz. No high-temperature minerals, as tourmaline or pyrrhotite, are noted in any properties in this area. Considerable tonnage of ore is said to be blocked out on this property, averaging $10 to $15 per ton.

The Montcalm and Tine claims, on Little Rice Lake, attracted attention last summer because of negotiations under way for financing their development. The country rock here is andesite intruded by porphyry and granite dikes, the andesite being fractured and metamorphosed, with the result that there are numerous large quartz veins in these wide fracture zones, containing free gold and abundant sulphides.

The Gold Seal, Gold Pan and Gold Pan Extension caused the promotion flurry of 1919. This area is underlain by andesites and more acidic volcanics, which are cut by various porphyry and granite dikes and by a few diabase dikes. These properties lay along the same fracture zone, which has been traced fairly continuously for 2,500 ft., with the usual uneven distribution of quartz. About 725 ft. of underground work has been done on the Gold Pan, and several hundred feet on the other two properties. These properties afforded spectacular gold specimens, the quartz in places being actually laced and interlayered with free gold.

The Oro Grande-Solo group, on Bulldog Lake, has been explored by the Anglo-Canadian Explorers, Ltd., a subsidiary of John F. Taylor & Son, English operators, by diamond drilling and underground work, and average values are reported to have been obtained of between $19 and $36, in a sheared zone cutting andesite lava with lenses of quartz.

Three miles west, on Long Lake, the Central Manitoba Mines, Ltd., of the WAD Syndicate, have developed their Kitchener, Hope and Growler properties during the past two years. They have a well-defined shear zone following a chert or clayey sedimentary bed, which has been stripped for 3,000 ft. and traced still further. Development work consists of a shaft 393 ft. deep with levels at 125 ft., 250 ft., and 375 ft. Eight hundred feet of drifting has been done on the 125-ft. level, and 940 ft. on the 375-ft. level. On the lower level, 800 ft. from the shaft, a winze has been put down 68 ft. About 2,000 ft. west of this main shaft a prospect shaft is now being sunk. Also 3,000 ft. of diamond drilling has been done. Average values are reported to be about $12 per ton, with an average mineralized width of about 6 ft.

It is generally concluded that this property contains workable ore, and development is being actively pursued in anticipation of installing the first unit of a 250-ton mill during the coming winter when heavy machinery can be freighted in over the winter road.

The holdings of the Anglo-Canadian Explorers, Ltd., and the WAD Syndicate have recently been combined, under the general administration of John F. Taylor & Son, London, England. About 1,400 acres of mining claims are involved in the combine and it has been capitalized at $4,500,000. Details of this transaction were recently published in the *Engineering and Mining Journal.*

About 3½ miles north of the Kitchener property a group of thirty-five claims was staked in June, 1925, by Russell Cryderman for the Mining Corporation of Canada. Two veins, displaying free gold, each averaging 5 ft. in width, have been stripped and traced for over 1,500 ft., with an average value reported as being over $30 per ton. A shaft has been sunk in the footwall to 275 ft. A vein was cut from 102 to 120 ft., showing an 8-ft. width of mineralized quartz and schist. On the 250-ft. level a crosscut and drift has been started to explore the second vein. The veins are in a shear zone in andesite with a quartz porphyry dike parallel to the veins in the hanging wall. The Mining Corporation is quite satisfied to pursue a vigorous development program, believing that it has a potential mine in this property.

Adjacent to the Cryderman property, the Victoria Syndicate has acquired a group of thirteen claims, presumably on the same break, and is undertaking exploration work to ascertain the extent and value of the deposit.

These three companies are the only ones operating or exploring in this district which have the proper financial background and mining experience to carry out a program of development. The Victoria Syndicate is identified with the Mond Nickel Co., the WAD-Anglo-Canadian are now associated with John F. Taylor & Son, and the Mining Corporation of Canada is a profitably operating and development Ontario company.

The Eldorado property, south of the southwest end of Halfway Lake, is, in the opinion of J. F. Wright, Dominion Geologist, an important group of claims. The country rock is a massive granodiorite with a well-developed fracture and shear zone and several smaller parallel fractures on either side. The main zone can be traced for nearly 3,000 ft. with an average width of over 3½ ft., containing considerable free gold and giving high assays. The deposit has been exposed by pits and trenches and a shaft sunk by hand to a depth of about 35 ft. Along this zone the granodiorite has been altered to quartz-sericite schist, and the quartz occurs as lens-shaped masses, containing some pyrite, chalcopyrite, and free gold.

In concluding discussion of the characteristics of the Manitoba gold areas, it may be stated that the gold as a rule occurs native, either separate in the quartz, or fine-grained in the pyrite and other sulphides. Some gold tellurides have been found, particularly in the English Brook section, north of the Winnipeg River, but not forming any considerable percentage of the total gold values. The associated minerals are to a degree distinctive of the districts. Pyrite is an invariable associate of gold, but arsenopyrite is characteristic of the Wekusko Lake section, chalcopyrite of the Long Lake and Rice Lake areas, and pyrrhotite of the Star Lake area. Galena, sphalerite, feldspar, tourmaline, and some stibnite occur in the vein matter associated with the gold in one or other of the districts.

The actual gold production in Manitoba has not been commensurate with the efforts put into development work during the last fifteen years. Mills have been in operation at the Luleo property (Wanipigow River) and Gold Pan property (Gold Lake), and incidentally the richness of the ore from part of this property resulted in flagrant high-grading. A small test mill is now operating at the Bingo property (Wekusko Lake). Sinking to a depth of at least 200 ft. and drifting on the veins for an equal distance has been done on seven properties, while shafts have been sunk to 100 ft. on fourteen gold properties. In some cases the values did not justify further development; in some, capital was not available for prosecuting the work further, even though the values disclosed by underground work were encouraging.

On the whole, the best opportunities lie in the large shear zones where the values may not be high, but where a large tonnage of rock of sufficient grade to be handled at a profit is more probable than in the narrow veins. Such shear zones occur not only in the sheared greenstone and sediments, but may run for some distance into granite as well.

Copper and Nickel Deposits Promising

The copper- and nickel-bearing deposits of the Winnipeg-Oiseau-Maskwa rivers sections of the southern belt of the eastern Manitoba field occur in fracture and shear zones in the andesite lavas and tuffaceous sediments, or along schistose zones following the contacts between these two classes of rock or between them and peridotite, gabbro, and granite. Along these schistose zones magnetite, pyrrhotite, pentlandite, chalcopyrite, pyrite, chalmersite, arsenopyrite, sphalerite, and galena have been deposited as dike-like injections, impregnations, and as replacements in the schistose country rock. The gangue materials are hornblende, tremolite, actinolite, chlorite, brown biotite, sericite, epidote, and quartz.

Prospecting in this area dates from 1895. Searching for gold and silver did not meet with much success and activity lapsed until revived in 1920, since when several nickel and copper sulphide bodies have been discovered and some exploration work has been undertaken.

Most of the development work to date has been done by the Manitoba Copper Co. of the WAD Syndicate and by the Devlin Mining & Development Co., Ltd., the exploration work being confined to shallow shafts and pits and some diamond drilling. The Manitoba Copper Co. is reported to have proved up several hundred thousand tons of ore averaging about 4 per cent copper. The deep overburden in this district makes prospecting and exploration work expensive and difficult.

The Flin Flon development is the most significant today, with large potential ore reserves as an incentive for operations. If plans are carried out in connection with this property as anticipated, $15,000,000 will be expended during the next five years in construction of railroad, smelter and mine plant.

In 1924 lepidolite, or lithium mica, was discovered in pegmatite, on the Winnipeg River. Since then other deposits of lithium minerals have been discovered, spodumene, and the more valuable lithium phosphate, amblygonite, and the variety montebrasite. Six tons of this ore from shallow pits has been shipped for laboratory testing. The depth of the deposit has not yet been determined, and as most pegmatite deposits are lenticular inclusions, usually of small or moderate size, the depth and extent of the lenses will have to be determined before mining activities are undertaken on a large scale.

The Silver Leaf Mining Syndicate has done practically the only development work in deposits of these lithium minerals, the deposits on this property occurring in pockets or lenses in the central portion of a body of pegmatite which is exposed for 600 ft. in length with an average width of 80 ft. The different minerals in the pegmatite are arranged in zones. The outer part is fine-grained and consists chiefly of pink feldspar and quartz. Within this rim the pegmatite is coarser and in addition to feldspar and quartz there are bunches and irregular-shaped masses of spodumene and montebrasite, these minerals forming one-half to one-third of the rock. About 350,000 tons of ore is reported to be uncovered, averaging 4 per cent lithia. The pegmatite intrudes the andesite country rock, which is a fine-grained, black rock, showing little evidence of the schistose structure characteristic of much of the lava of this area.

This southern belt is the most advantageously situated for power and railroad facilities of all the Manitoba mining areas, sections of this area being only between 10 and 20 miles from the hydro-electric power plant of the City of Winnipeg at Point du Bois on the Winnipeg River.

Manitoba can no longer be considered a purely farming province, the operations in the various mineral districts have demonstrated that the gold and copper areas of the province are not only extensive but will shortly reach the producing stage. Numerous properties and prospects are awaiting capital for development and hold out promise of substantial returns for work done. The districts are rapidly solving some of their problems. Surveys for railroad and power lines have been made and these are practically assured. In the absence of railway transportation facilities only the larger well-financed syndicates and companies have undertaken anything like elaborate development work. The average cost of hauling freight to properties in the eastern Manitoba area, usually done in the winter over frozen roads, is between $30 and $40 per ton.

Underground development in various places has indicated that in most cases the outcrops give a fair indication of extent and values in depth. Since the outcrops of the sheared zones are lens-shaped, and the mineral-bearing deposits in the shear zones are irregular in shape and distribution, a great deal of expensive exploration, combined with systematic sampling and assaying, must be done to prove the shape, size, and value of each property.

Mica Mining and Milling Methods

North Carolina Producing Properties Have Operated Since 1860—Crushing, Washing, Screening, and Drying Main Steps in Preparation

By Toner Antisell
Rutherfordton, N. C.

FROM THE TIME mica was first mined in North Carolina the aim of the miner has been to produce sheet mica of the larger sizes, which has always sold for good prices. The incentive to work for weeks without encountering other than small sizes of mica was sometimes rewarded by the appearance of block mica weighing hundreds of pounds. By careful stripping of the lamina from the outer parts toward the center, the miner might obtain several pounds of the larger sheets, worth dollars to the pound, and more valuable than all the rest of his output combined. The interest shown by the best type of mica miners is as keen as that of the gold miner, but the mica miner when taking out pattern mica uses the utmost care, as carelessness in picking into the blocks of mica may mean a loss of the valuable sheet product. In years gone by mines situated miles from a railroad were operated for pattern or sheet mica, as evidenced by the piles of waste to be seen today. These residues, in some places amounting to hundreds of tons, worthless then, may be reworked in the near future. The building of good roads will be the means whereby this scrap may be brought to the mills which transform it into an article of economic importance.

I have been operating the property of the Piedmont Products Co., at Rutherfordton, N. C., during the last two years, and a lode containing a remarkable deposit of mica has been developed. The old workings in Isin-Glass Hill, reported worked prior to 1860, have produced much pattern and more scrap mica. Three lodes, parallel with the strike of the outcrop in Isin-Glass Hill, have been crosscut from a shaft about 500 ft. south from this hill. These lodes are separated by a few feet of wall, the characteristic red schist of the Piedmont plateau region. The Eastern vein is 34 ft. wide, with a low mica content, the matrix having about 35 per cent of kaolin and the remainder feldspar and quartz. The Western vein is 22 ft. wide. Kaolin predominates over the feldspar and contains about 3 per cent of fine mica, 20 to 60 mesh. In a crosscut 40 ft. below the collar of the shaft the central vein is 27 ft. wide. It has a strike in a general direction of N. 20 deg. E., dipping to the west. All of the feldspar from the surface to the water level, 80 ft. below, has altered to kaolin. Within this body of kaolin is a lens of quartz varying in width from 2 ft. at the surface to 8 ft. at a crosscut on the 60-ft. level. From a distance of 10 ft. above this crosscut to the surface, and for a distance of 180 ft. to the north and 270 ft. to the south, a lens of mica was encountered on the hanging wall. At the crosscut on the 40-ft. level the mica lens measured 7 ft. across, gradually diminishing in width until at the northern and southern extremities of the quartz lens it disappeared. Ten feet below this level it was absent completely, although the quartz was wider than above. To the south, starting about 100 ft. beyond the southerly end of the first lens, there is another lens of quartz with mica on the hanging-wall side, but which further on splits, part being found on each side. The mica in this lens is frozen to the quartz in places. At other places the mica follows the quartz continuously, but is imbedded in the kaolin next to it. This mica is a slightly stained muscovite of the "A variety." The mining is all done by pick and shovel. The lens is first stripped of kaolin, then picked down as cleanly as possible, no care being necessary in picking into it, as it is all ground. Under these conditions mica can be mined cheaply. The drifts are timbered soon after having been driven, for the kaolin falls and blocks the tracks. Narrow stopes are carried up from the levels, with manways at 40-ft. intervals. The waste is dropped under foot, filling the lower part of the workings as they extend upward. Development below the 60-ft. level has not been prosecuted. Whether mica occurs lower down on the same lens of quartz, or occurs with another lens of quartz below, is a question which is most interesting and the outcome of which may be a guide to future exploration and development.

Dry Grinding of Mica

The milling plant of the Piedmont Products Co. is strictly a dry grinding one, and is the result of several years' experience and progress. As the mica is received from the mine it is in pieces of various sizes, to which adheres some kaolin, and within the laminations of which are crystals of quartz, garnet, and beryl. The mica is first washed with water through a trommel, having ¼-in. openings, to eliminate the kaolin and such silicates as will pass through the screen. As the mica passes from the trommel it falls to the floor of a receiving bin, where it is allowed to drain. Any pieces of quartz passing the screen roll to the perimeter of the pile and are thrown out by an attendant, who feeds the dewatered mica to an elevator that discharges into a drier.

Oak and hickory obtained from clearing land are used for fuel. Pine is not used, as the distillates from this wood, or the soot from soft coal, will blacken the mica. A heat around 95 deg. C. is maintained. From six to seven minutes is required for a given particle to pass through the drier.

From the discharge end of the drier the mica falls 8 ft. into the boot of an elevator which delivers it into an inclined chute to the hopper of a hammer mill. Each hammer mill has a series of six pinions fixed around a central shaft which revolves at 2,000 r.p.m. On each of these pinions are twenty knives, of machine steel, each ⅛x2x6 in. These are placed on the pinions by having holes bored through the 2-in. face near the ends. The knife may be reversed when dulled. As the shaft revolves the knives swing out by centrifugal force and strike the mica a blow, tearing one lamina from another by the impact against a plate just far enough beyond the circumference of the outer edge of the knife to

allow a slight clearance. This plate is corrugated and covers only a portion of the inside of the lower circumference within the mill casing, the remainder of the lower part being covered with a screen through which the mica is forced as ground. The rending action in this mill is so strong that pieces of mica several inches in length and two to three inches thick are completely broken and torn up and will pass through a half-inch opening within a minute.

The mica passing through the screen is conveyed by a 10-in. screw conveyor to a bucket elevator, which raises it to the fourth floor of the mill, where it drops by a short slide into a No. 7 Rotex sifter. This 20-mesh sifter makes two products. The oversize is conveyed by a 10-in. screw to a storage grinding bin. The minus 20-mesh product is treated by falling through an upcast current of air to cleanse it of impurities. As it passes from the screen it is guided by gravity to the top of a box 11 in. square inside. Within the box, deflectors are placed from two opposite sides at an angle of 60 deg. from a horizontal plane; the length of these deflectors is such that the ends overlap at the middle of the box. Small strips are tacked on these wings, which spread the mica as it falls from one deflector to the next.

Five feet below the top of the box is an ell through which a 10-in. pipe is inserted, leading to the inlet of a suction fan. A board placed in front of the pipe, within the ell, on a slope of 45 deg., acts as a deflector to the fine particles of silica which remain with the mica. The mica is drawn by suction around the 90-deg. bend as it falls in the box, thence upward over the board and into the pipe, while the sand either bounds back against the current of air, or falls and accumulates on the slope of the board and then slides off into a bag to be disposed of later.

The minus 20-mesh mica passing through the fan is blown into a dust collector, an inverted cone-shaped metal receiver. The top of this cone has a vent (covered to keep out rain) which releases the air entering under pressure, and the mica previously held in suspension falls to the bottom, or the apex, where it is led by gravity to another Rotex sifter. This sifter has two screens, and the material passing through goes to bins for the finished grades. Any oversize goes to the storage regrinding bin.

The mica from the storage regrinding bin falls by gravity to a magnetic-belt separator, over which it passes to a chute, which splits the flow. One part falls directly into a second hammer mill; the other part is conveyed by a 4-in. screw to a third mill, each mill having a speed of 2,000 r.p.m. The screens on these two mills have openings ranging from $\frac{1}{8}$ to $\frac{3}{4}$ in.

The mica passing these hammer mills is drawn by a suction fan through a wye and lifted to the top of the mill, where the stream is split and delivered to two cone-shaped dust collectors of different sizes. The smaller one feeds one No. 8 Rotex sifter and the larger one two other sifters. Each sifter has two screens; the oversize from the top screen is returned to the grinding bin, and the next two products are dropped directly into bins as finished products. From here a bagging machine receives the material. The filled bags are quite uniform in weight and mixture. A cubic foot of a 20- to 60-mesh mica from this plant will weigh from 14 to 17 lb. and a —60-mesh will weigh from 20 to 22 lb.

The efficiency of the mill operations depends to a large extent upon the area of screening surface available. Where two sizes are desired, for instance, a 20- to +60-mesh and a —60-mesh product, each No. 8 Rotex has a capacity, on dry material, of about 400 lb. per hour, so under favorable circumstances five to six tons of mica can be screened out in ten hours from three double-screen sifters.

SPECIFICATIONS

Roofing manufacturers using ground mica have certian specifications which must be adhered to closely by the mica grinders. Varying factors are responsible for a change from a certain screen size, as in micas from various sources there is a difference in the tenacity of the different varieties. The dullness of the grinding hammers is another factor both as to the percentages in sizes and the quantity ground; and the possibility that holes may wear in the screens is of only minor importance, where inspection is made regularly, but the most likely cause in difference in the results. The following are specifications called for by two roofing concerns:

Specifications No. 1	Per Cent	Specifications No 2	Per Cent
Over 20 mesh, not more than..	4	Over 20 mesh, not more than..	1
20 to 28 mesh, from.....	15 to 25	20 to 40 mesh, not over.....	45
28 to 35 mesh, from.....	15 to 30	40 to 60 mesh, not over.....	30
35 to 65 mesh, from.....	20 to 40	60 to 80 mesh, not over.....	4
65 to 100 mesh, not over.....	25	80 to 100 mesh, not over.....	6
Through 100 mesh, not over...	10	Through 100 mesh, not over..	14

DRY VS. WET GRINDING

The cost of dry grinding is much lower than grinding by the wet method; the space occupied by the machinery for the former is much less, and the output per grinder is several times as great as with the cumbersome wet grinding paraphernalia. The principal difference in favor of the wet-grinding method is that the ground product has a greater sheen than any dry-ground mica. This difference is sufficient to cause a preference for the wet-ground product for the wall-paper trade, and it commands a higher price than the dry-ground mica for the same screen sizes. The roofing trade, however, is demanding a brighter quality of coarse dry-ground mica than was formerly sold, so means are being sought to obtain this quality in the finished product by improving the methods of preparing the crudes for dry grinding.

North Carolina has been a consistent producer of mica for many decades, and statistics show that the production of mica in this state ranks ahead of that of any other state in the union. The production of North Carolina scrap to that of the total domestic scrap is 53 and 47 respectively, and the percentage of production of North Carolina scrap to the total North Carolina mica output is about 83 and 17 respectively.

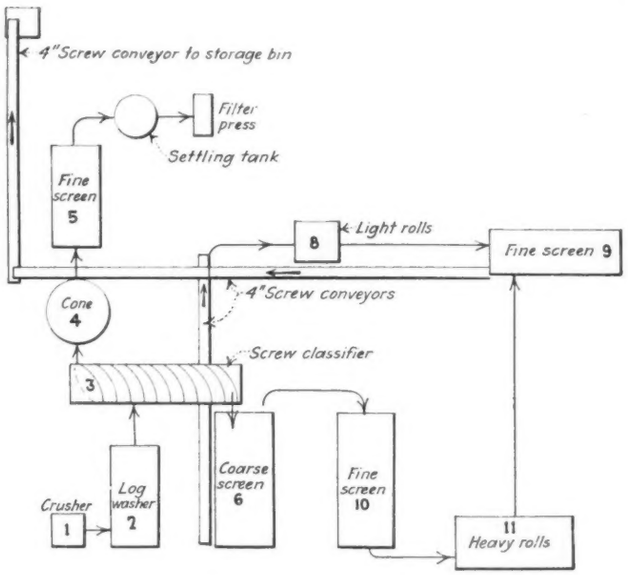
The principal uses of ground mica are various, and as follows: Patent roofing, 60 per cent; wall paper, 21; auto tires, 8; fancy paints and decorations, 3; moulded insulation, 3; lubrication, 2; annealing, filling in rubber other than in tires, printing, lithographing, sizing cotton, and miscellaneous, 3.

The value of scrap mica during the last year in North Carolina was around $18 per ton. That of dry-ground mica is as follows: 20 mesh, $38 per ton, and 100 mesh, white, $70 per ton.

Near Franklin, N. C., a deposit of pegmatite, containing mica in sufficient amount for economic recovery, has been developed; it has been opened 500 ft. along

the strike of the lode, 90 ft. wide, and to a depth of about 40 ft. The workings are on the summit of a hill 90 ft. above the Tennessee River, and consist of an open pit, the bottom of which has an outlet by a tunnel which leads to the mill. The lateral excavations in the pit are made by a series of benches, stripping of the overburden preceding mining.

The mica varies in size from 100 mesh to pieces three inches across; and varies in thickness from a fraction of an inch to several inches. The mica content of the rock is estimated at about 20 per cent. Upper portions



Flow sheet General Mica & Clay Co., Franklin, N. C.

of the lode have weathered so that kaolin replaces part of the feldspar, and the greater part of the matrix is friable. This deposit is valuable for its mica and clay content and is exceptionally well situated for cheap mining, milling, and the disposal of the waste. All stages of the operations in mining and the milling take advantage of gravity.

A recent installation of machinery to treat this pegmatite for the clay and mica contents has been installed by the General Mica & Clay Co., Franklin N. C. It was constructed and is operated by Devereux D. Rice, superintendent, and it is one of the most complete and efficient plants in the state.

Mill Flow Sheet

The ore is trammed from the open pit over a trestle, from which it is dumped on a platform on a level with the top of the primary crusher in the mill. It is hand-fed to a high-speed centrifugal beater (1) operating at 1,000 r.p.m., and having grate openings of $\frac{3}{4}$ in. The rock is crushed dry, but a stream of water sluices the broken material from below the grates into a log washer, (2). The kaolin content is here beaten loose from the mica and quartz, being finely disintegrated and held in suspension. The mica and quartz free from kaolin pass into a screw classifier, (3). The box inclosing the screw has been built up to a height of 3 ft. above the bottom at the end where the screw is submerged. This is for the purpose of allowing a thinner slip to be made and the lighter sands to have a chance to settle quickly. The thin slip flowing over the heel of this classifier is collected in the cone, (4), which makes further separation of the sand from the slime. The overflow from the cone goes to a screen having an opening of 100 meshes to the inch. This screen, (5), eliminates any flake mica passing over from the cone. The slime from the screen, (5), passes to settling tanks. From these tanks the thickened slime is pumped to filter presses. The cake is both steam- and air-dried on floors, after which operation it is loaded for shipment.

From the upper end of the screw classifier, (3), the coarse mica and silica are sluiced into a revolving screen, (6), having $\frac{1}{2}$-in. openings. The material passing over the screen (plus $\frac{1}{2}$ in.) is carried by a 4-in. screw conveyor to a set of light rolls, (8), thence to the revolving screen, (9), having $\frac{1}{8}$-in. openings. The underflow from screen, (9), goes to waste.

The material passing through screen, (6) (—$\frac{1}{2}$ in.), is led to a revolving screen, (10), having $\frac{1}{8}$-in. openings. The oversize is delivered by a drag belt to a heavy roll, (11), after passing through which it goes to the screen, (9). The undersize from the screen, (10), is waste, containing mostly fine sand.

Fresh water is applied at each screening operation, so that no particles of sand adhere to the mica when it reaches the rolls. The amount of rock included here with the mica is negligible and is all washed out in the first part of the screen, (9). The mica coming off this screen is very smooth. From the screen, (9), the mica is conveyed by a 4-in. screw to a cross-belt having drags attached, which apparatus in turn conveys it to a storage bin.

From the storage bin part of the mica may be drawn automatically into a drier, from which it is fed to two Raymond beater mills revolving at approximately 200 r.p.m. From the mills the ground mica is hoisted by a bucket elevator and fed to two bolting reels, one having a 20-mesh screen and the other a 100-mesh screen. The 20- to 100-mesh constitutes one grade of roofing mica, while the —100-mesh mica commands a much higher price and is used for other purposes than as roofing material.

The Horne Hoist

The Horne Copper Corporation of Rouyn, Que. (controlled by Noranda Mines), has placed an order for its main hoist. This will be a double-drum hoist, driven by electric motor through herringbone gears. The drums will be 8 ft. in diameter by 4 ft. face, and each will have an axial type plate clutch. Either drum may be used alone, but ordinarily they will be operated in balance.

Hoisting speed, when the hoist is first installed, will be 750 ft. per minute, which will be sufficient for a depth of 600 ft. Later, the speed will be increased to 1,500 ft. per minute, which will enable the same rate of production to be maintained to a depth of at least 1,200 ft.

The motor for the initial installation will be 250 hp., which will be changed later to a 450-hp. motor when the hoisting speed is increased. The motor will have a liquid regulator for controlling the starting, a form of control which gives smooth action. Safety devices are provided. Hoisting will be done in cars, as there will be too many classes of ore to handle conveniently in skips. The hoist will be almost a duplicate of the one which is now operating at the Lake Shore mine, Kirkland Lake, Ont.

Useful Operating Ideas

Misfires and How to Prevent Them

In the July number of *The Reef,* published in the interest of miners' safety and welfare in South Africa, an article appears on the subject of "Misfires and How to Prevent Them," written by D. Moore. This is of interest in that it gives a comprehensive discussion of the subject based on practice in an important mining field where operating conditions are onerous and are complicated by the employment of natives. The article, somewhat condensed, is as follows:

Misfires are due to a number of causes. The most important of these are:

(1) Faulty explosives, detonators and fuse.

(2) Faulty manipulation in charging up, giving rise to—
- (a) damaged or badly cut and crumped fuse;
- (b) withdrawal of the detonator from the untied primer cartridge and stemming the detonator in the tamping;[1]
- (c) an air space between cartridges, owing to faulty stemming[1], resulting in unexploded cartridges remaining in the hole;
- (d) spacing explosive cartridges with tamping to distribute the explosives over the length of the hole.

(3) Cut-off holes, due to—
- (a) insufficient care when cutting timing fuses;
- (b) lighting up in wrong rotation;
- (c) premature detonation of holes when a charge adjoining goes off;
- (d) badly drilled holes, which, when exploded, carry away the detonator and fuse and a portion of the charge of an adjacent charged hole.

In order to view this subject in its right perspective, it is necessary to start with the axiom that misfires are preventable.

The manufacture, storage and use of explosives is governed by carefully thought out acts and regulations. The manufacturer is referred to in passing as one of the causes of misfires in faulty material. The position, however, would be intolerable if there was a lack of confidence in the manufactured article. Large amounts of faulty explosives are handled daily on the mines, but fortunately the manufacturer—who often gets the blame—is not responsible.

Deterioration Seat of Much Trouble

(1) Explosives deteriorate in transit from the factory owing to freezing. It has been known that the explosives passing through the Karroo in winter become frozen; wagons on the Reef outspan, and for the whole night the explosives are exposed to a temperature far below freezing point. Explosives in this condition have been issued, and are then in a very sensitive state and do not behave normally. It either results in a premature explosion when it is stemmed in a drilled hole, or it fails to detonate, giving rise to a misfire.

The magazine master—if competent—will suspect the cold winter nights. In other cold countries, a current of air, warmed by passing an electrical heating apparatus, is blown into the magazine to thaw any explosives brought in in a frozen state. On this mining field a seasonal warning to all miners by the Mines Department would not be superfluous, as in many cases the magazine masters have not the necessary knowledge of the product they handle.

The miner should be suspicious during the cold weather when he notices that his cartridges are brittle and not what he handles every day. He might remember that frozen explosives are not iced explosives, as they freeze above the freezing point of water. If there is any doubt, an "old-timer" from Europe will be a good man to consult.

The explosives become faulty or deteriorate when stored in the miner's boxes. The explosive cartridge consists of an absorbent, and the explosive chemical. The absorbent serves two purposes: first, it contains the explosive chemical in definite measured quantities, and, second, it enables the manufacturer to make up this chemical in a convenient form for transportation and manipulation. The absorbent deteriorates to some extent in the hot, very often supersaturated atmosphere of the mine, and some of the explosive chemical is expelled, which in itself is a danger, but the explosive loses strength and become less sensitive. For this reason, old explosives are a danger, and cause misfires. Explosives should be used strictly in rotation. Not more than two or three days' supplies should be requisitioned for at once, and old explosives, particularly the sticks reclaimed after the blast, should be deliberately destroyed.

The officials of the mines, by careful supervision, can eliminate misfires caused by deteriorated explosives, including detonators. They should educate the miner and encourage him to report on any defective explosives in his possession. Strict attention should be paid to the various mining regulations dealing with the storage and care of explosives underground. Fuses should not be issued if they appear to be old or the windings perished or brittle. The practice of issuing fuses with detonators attached from the factory is a great advance in the right direction over the old practice, when every cap box in the mine contained a number of old detonators which, when used, failed to detonate, leaving misfires.

Careless Handling Causes Trouble

(2) Misfires due to faulty manipulation in charging up form the most important class. They not only stamp the miner who charges up as being careless, taking chances with his own life and the lives of other persons, but reflect on his ability to do the work on which his earnings depend.

The fuse leading to the detonator in the primer cartridge contains the delicate channel through which the explosion is effected—the blood stream to the heart. If the fuse is badly handled, kinked and twisted, the continuity of the powder might be damaged and the burning speed delayed or completely destroyed, resulting in a misfire. To prevent this, fuse should never be rolled tighter than the manufacturer rolled it in the original coil; it should not be pushed into the hole in a multi-doubled up state. If there is the least doubt about its remaining in a damp hole for some time after charging, special precautions should be taken in the way of additional waterproofing. There are preparations on the market for quick and effective waterproofing, and some mines issue special waterproofed fuse with detonator attached on the request of the miner. The fuse should be cut square and inserted into a clean detonator. two details which are very essential, and the crimper should be of the right design, so as not to prevent the fuse from burning through into the detonator.

Failure to Tie Fuse to Primer Is Illegal

A prolific source of misfires is the omission to tie the fuse to the primer cartridge. When the primer cartridge is pushed into the hole, the fuse is pressed against the side of the hole, or held too tightly, and is thus drawn out of the primer. The detonator is then lying outside the charge and is tamped against the side of the hole. When detonation takes place the blow is expended in the tamping, without reaching the charge, and a misfire results. It is not only illegal, in terms of the mining regulations, to omit tying the fuse to the primer cartridge, but it is a source of great danger, as numerous men have lost their lives by striking the exposed detonator with the charging stick and causing a premature explosion.

[1]Stemming and tamping are used in a reversed signification as compared with American mining practice.

Tying the fuse to the primer cartridge is a small job; it is in the interest of the miner in every way, and the conscientious shift boss will satisfy himself, in the interest of safety and efficiency, that in his section the bad practice of using untied primers does not exist.

Charging a Serious Operation

A class of misfire that is difficult to explain is the type where a stick or two of explosives remain at the bottom of an otherwise apparently completely exploded hole; in other words, an old socket containing misfired explosives. This class of misfire incidentally is difficult to detect by mere observation, and therefore the greatest source of danger. The only explanation of these misfires is that the charging up is defective, and that an air space is left between successive cartridges. The complete detonation is prevented by the resistance of this air cushion.

Charging should be considered the most serious and delicate operation in the day's work, and one in which the miner should take real interest. This particular work has been reserved by law for the white miner, and it is his duty to respect the trust placed in him. Although it is difficult to account for this class of misfire and, therefore, more so to find a remedy, it is, however, quite an easy matter to prevent an accident occurring, provided the miner treats every socket with the greatest respect. Every socket should be looked upon as a potential misfire until it has been proved to be otherwise. The mining regulations have a number of provisions aiming at preventing accidents caused by drilling into or intersecting sockets, but these are inadequate. As has already been remarked, a socket is either dangerous or it is not. When cleaned out to the bottom, and it contains no explosives, it is harmless. At present, the only search which is legal is to wash sockets out with water, with usually an inadequate pressure, or blowing out with air, when sockets are under water. Both methods are half measures, as it is impossible to wash out long sockets with water.

Every socket should be washed out and probed to the bottom by means of a short length of copper pipe attached to the water hose. A copper wire or scraper should be used to pull out any large pebbles which cannot be displaced by the water.

If explosives are found, there are two ways of dealing with the hole. The safest is to leave it alone, and recharge and blast it at the end of a shift. In the meantime, suspend all operations of drilling in the vicinity. The second course is to extract the explosives by means of several devices which have proved to be safe instruments for the purpose. The air and water blow-pipe is referred to, and also the copper pipe at the end of the water hose, which has a corkscrew attachment for pulling out the cartridge. The mining regulations should be amended to make this possible and leave scope for further research in this direction.

Tamping Between Cartridges Bad Practice

Another source of misfires, but fortunately not a very common one, is due to the exceedingly bad practice of some miners, who place tamping between the cartridges. This is done with the idea of distributing the charge more equally over the length of the hole. Needless to say that this is only done by very ignorant men. Yet it is astonishing how many little fads and bad practices there are among miners in connection with charging up holes. Some miners will never place a cartridge in a hole till they have broken it, destroying the wrapper—and a most dangerous practice in frozen dynamite.

Short Fuses

(3) The last source of misfires, and a very common one, is cut-off holes. This class of misfires, like a misfire due to faulty explosives, are immediately recognized by any observant man, and the necessary steps can be taken to render them harmless. These misfires, however, can be eliminated to a large extent by exercising a little ordinary care. Where a number of holes are to be fired in rotation, the fuses should be cut to allow the holes to go off in the proper order. It may be well to remember that the firing speed of fuse will often vary up to 10 sec. or over to the yard, and it is therefore a good practice to cut the fuse to give a margin to cover this variation.

Misfires from cut-off holes are not infrequently caused by lighting fuses in the wrong rotation. As a certain amount of time must elapse between the lighting of the different fuses, it follows that the timing of the fuses will be insufficient to counterbalance this loss of time. It is, therefore, essential to impress upon the person performing this duty to start and end up according to plan. As in the case of bad timing, faulty lighting will be responsible for premature ignition, thereby carrying away the top of an adjoining hole containing the primer cartridge.

Incompetence and Error of Judgment

The last source of cut-off hole misfires is due to the incompetence of the miner, or to an error of judgment. Drilling holes in such a way that one could do the work of two is loss of time, labor and wages. Only too often holes are drilled with so little burden that they will not only remove what they have been designed to do, but a great deal more, and carry away a portion of an adjoining hole before it has had time to explode. Each hole should be drilled to carry sufficient burden for the explosive employed, without damaging adjoining holes.

It has been suggested that if a fuse could be manufactured which would not ignite the explosive laterally, then it would be a great advantage to place the primer cartridge at the bottom of the hole. Any unexploded cartridges would be expelled from the hole, and if the primer cartridge did not explode, the misfire would be easily recognized.

It is doubtful, however, if lateral ignition is possible, owing to lack of oxygen. Should this be the case, it would give rise to large volumes of poisonous gas, which would often be included by the broken rock, and hence a danger to the lashing[3] gangs. Some of these are highly poisonous, and do not dissolve in water or only very little. It is, therefore, not advisable to adopt this method of charging until some experiments have been carried out. The much-maligned air and water blow-pipe for extracting explosives has come to stay, and no miner should omit to scour the area to be drilled over with this instrument to expose all obscure corners and depressions appearing at the end of an unexploded hole. Many sockets are completely closed with fine rock, and it is only by blowing over with air and water under a strong pressure that they are discovered. *Treat all sockets as misfires, until they are proved to be otherwise,* after washing out with a copper water pipe and copper probe.

Lime Circuit at Magna Mill

At the Magna mill of the Utah Copper Co. lime is ground in a conical ball mill in closed circuit with a rake classifier, the overflow being piped to two large steel storage tanks in the upper part of the fine-crushing division of the mill. A twenty-four-hour supply is maintained. The tanks are equipped with slow-moving agitators on vertical shafts driven by vertical motors and speed-reducing gears. The two tanks are equipped with a pair of direct-driven centrifugal pumps, which discharge into a common launder over the lime feeder and maintain a constant level of milk of lime in the feeder box. The feeder box contains a horizontal shaft carrying a series of metal disks; on both sides of each disk, except the end disks, are metal buckets which dip into the lime hydrate solution and discharge the lime into separate launder outlets. These end disks are provided with buckets on one side only.

The shaft is driven by a motor and speed reducer. The speed reducer permits of twelve variations in the speed of the bucket shaft. Wooden launders convey the lime solution to the bucket elevators receiving the undersize of the impact screens. The mill circuit is tested every half hour for alkalinity and the feeder adjusted accordingly. One man on each shift makes the alkalinity tests and feed adjustments. Tests are made with phenolphthalein indicator and a standard sulphuric-acid solution.

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[3]Mucking crews.

Discussion

"Engineering and Mining Journal" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief. Letters will not be printed unless the author's name and address are known to the editor.

The Sullivan Ore

THE EDITOR:

Sir—A reading of Mr. Schwartz's "Microscopic Features of Sullivan Ore" suggests some questions on the origin of the deposit and, as well, affords material for some interesting speculations. The quotation from Mr. Schofield's description will bear repeating and is here reproduced:

"The orebody conforms in dip and strike with the quartzites and cannot be called a true fissure vein; but a replacement deposit in which the sulphides replaced the fine-grained quartzites. The hanging-wall and footwall are not well defined and the ore grades gradually into the country rock, except where the country rock consists of thin-bedded slaty quartzites which are evidently difficult to replace.

"The orebody is arranged in distinct zones, which grade imperceptibly into each other. The center of the lode is occupied by a fine-grained mixture of galena and zinc blende, in which masses of purer galena occur as large lenses. . . . The gangue in this inner zone is absent, except for a few idiomorphic crystals of pink manganese-bearing garnet. This inner zone passes exteriorly into a fine-grained mixture of pyrite, pyrrhotite, and zinc blende, which contains as a gangue numerous crystals of an almost colorless garnet with some grains of actinolite or possibly diopside."

Questions suggested: Why replacement? Why were the "thin-bedded slaty quartzites" more difficult to replace? If this is a replacement occurrence, how account for the symmetrical arrangement of the high-temperature minerals exteriorly with an inner zone (gangue practically absent), a fine-grained mixture of galena and zinc blende "in which masses of pure galena occur as large lenses"? What became of the silica of the quartzite upon replacement, and, if the earlier crystallized minerals were replaced by galena, what became of the replaced constituents of the pyrrhotite and sphalerite? Did the granite and gabbro replace the quartzite and other sediments?

Referring to the micrographs in which the inclusions of pyrrhotite in sphalerite and vice versa are shown, and those in which both the above are shown as "inclusions" in galena, the question arises: Did the first crystallized entirely replace the quartzite and the later crystallized galena replace the former, or, if the former retain their approximate original size, how did they arrive and what greater potency had the galena that enabled it to entirely replace the surrounding remaining quartzite?

Visualizing the occurrence by the description above quoted, also (p. 377) "In the upper levels, between the ore zones, the replacement is composed entirely of pyrite, while in the lower workings it consists of fine-grained massive pyrrhotite," we recognize the characteristics of a typical, ore-magma invasion.

It is evident, from the intimate association of pyrrhotite, sphalerite, and galena, that the ore magma came to place in a fluid state and under temperature and pressure conditions above those of consolidation (crystallization) of any of the constituent combinations ultimately segregated. Under these conditions the high-temperature minerals would, in time, reach their critical temperature about the periphery, adjacent to the cooling walls and expressed into the crushed quartzite (the massive quartzite being more susceptible to crushing than the thin-bedded), crushed by the forces of the intrusion, and there crystallize while the lower temperature minerals, the mixed sphalerite and galena, and the galena, still fluid, are segregated toward the interior of the crystallizing magma. At the center we find the "lenses of pure galena," the lowest temperature mineral, the last to crystallize and with the gangue practically absent.

On page 377, in the first paragraph, Mr. Schwartz notes:

"In the case of galena, there is abundant evidence that at least the greater part of the mineral *entered* and crystallized later than either pyrrhotite or sphalerite, which are found in galena as *rounded*, obviously *corroded remnants* (ice-cake structure). This characteristic texture is found not only in the ore which is predominantly galena, but in every specimen in which galena occurred as large enough areas, remnants of pyrrhotite and sphalerite were found (Fig. 3 and 4). In several specimens very small areas of galena occur as irregular inclusions in sphalerite and pyrrhotite. This suggests that small amounts of galena may have crystallized simultaneously (?) with those minerals. There is no doubt, however, that nearly all the galena crystallized at a distinctly later time."

Galena occurs inclosed in some specimens of both sphalerite and pyrrhotite, from which it seems obvious that all were present during consolidation. Hence the question arises as to the galena having "*entered* and crystallized later"? It is logical that in some certain situations conditions favored the crystallization of the galena, later, to be surrounded by either of the other minerals, the exception; whereas, the normal temperature succession of the galena seems to be the general rule.

Looked at petrographically (not as of ores), the micrographs strongly suggest pegmatite, graphic granite, and porphyry. A mass of injected matter such as is suggested in this case would remain in a more or less fluid condition for an appreciably long period, and undoubtedly subjected to fluctuating movements

(flowage) and to shocks, during which the processes, of crystallization of the several ultimate constituents were under way. Such agitation of the crystallizing magma would have an eroding (rather than corroding) action on the previously crystallized aggregates of the earlier ores, supported in the magma. Thus the final consolidation of the galena groundmass would tend to produce a "porphyritic" texture. This is illustrated in Figs. 3 and 5. It is conceivable that shock, such as would be the natural sequence to an invasion the magnitude of this, would have the effect of shattering and disarranging the crystallizations already formed and in suspension, producing the effect shown in Fig. 2, the angular fragments of the earlier crystallization.

Replacement is easily assumed. Actual operations in economic mining are seldom sufficiently extended into the "country rock" to determine the actual relations and effect upon the intruded or adjoining formation and to what extent these may be due to replacement or displacement, or both.

L. S. ROPES.

Helena, Mont.

As a Lawyer Sees Mining

THE EDITOR:

Sir—I have just read your article entitled "Mining Success," in your issue of Nov. 13, 1926. Either you are woefully ignorant of prospecting and the possibilities thereof or else you purposely condemn the very industry you are supposed to be "boosting." Without question this Western country contains "Lots of Good Prospects." You mention about these properties eluding the search of the so-called mining scout. Now let me tell you that this country is full of so-called mining scouts who are looking for a paying mine with ore blocked and in sight more than sufficient to pay the purchase price, and they don't find such mines for sale. One in this county only recently made the fabulous offer of 30 per cent of the value of the net ore in sight as a purchase price. He is one of the mining scouts that can't find any mines. Of course if you have reference to mines with blocked ore, they are scarce. Why would any man with a mine with blocked ore care to sell to some outfit that will offer only 30 per cent of the value of the net ore in sight?

In order that you may not misunderstand, by net ore I mean the net value with mining and reduction figured out. Mining properties of the prospect stage are plentiful, ones whose showing, geological conditions, location, and other circumstances fully warrant further development. But to get any of these alleged mining scouts to even so much as look at a prospect is out of the question; they want to see blocked ore, and when told that there is no blocked ore, they lose interest and quit.

I can name every mine in this county and truthfully say that at one time such mine did not have one pound of ore in sight, hence would not have been of interest to you or the so-called mining scout, and you know full well that several of the large mines of the world are located in this county. Your own paper and the same issue from which I quote has an article from W. F. Staunton, a mining geologist of nation-wide standing, which recommends the old Congress mine for further development. At this date it is less than a prospect and is one of the things that these mining scouts have turned down. I agree with the eminent geologist; it is a mine worthy of further development, and this Western country abounds in just such prospects. I am glad that I have the personal acquaintance of Mr. Staunton, and can say from personal knowledge that he has been able to find many meritorious prospects and he will not say that such are scarce as hens' teeth.

Before the coming of the large copper mines and the cigar-stand mining scout it was possible to get mining men interested in meritorious prospects which did not have ore blocked, but this gentry known as the mining scouts (so very careful of their alleged and pretended reputations) condemn everything that does not show large bodies of blocked ore.

Come out of the land of dreams just a little while and give the prospector his just dues. There is not one mine in all the world that was not a bare prospect to begin with, but when intelligent men with brain and nerve came along this bare prospect became a reality and a mine stood where only the bare prospect stood before. You forget that the United Verde Extension was not only turned down by these mining scouts but by many geologists, and then James Douglas made one of the world's famous mines. The physician was right, the West abounds in good prospects and with the elements he mentions the percentage of successes far exceeds that of any other line of business.

If you do not feel that you can defend the line of business you pretend to represent then quit it and take up some other endeavor, but if you are going ahead with mining give it its just dues and don't say that good mining prospects are scarce, for that is not true. I tell you what is scarce: that is men with money who have the brain, nerve, and foresight to mine.

In order that you may become more familiar with this country I refer you to Bulletin 782, issued by the U. S. Geological Survey, in which you will find described some quantity of good prospects and all in this county. Just make yourself acquainted with the mining West and its possibilities. Government papers are of more worth than the statement of cigar-stand mining scouts.

Prescott, Ariz. J. E. RUSSELL,
Attorney at Law.

Additional Metal Price Averages Wanted

THE EDITOR:

Sir—Your "Market Report," as compiled, shows average prices for weeks ended Wednesday, rather than for the calendar week ended Saturday. Inasmuch as numerous companies make settlements for lead upon average prices for the calendar week, would it not be advisable to show this compilation also, in your market report. The writer has made smelter settlements for over twenty years and in three countries, and invariably the calendar week averages are used.

If there are enough readers of the "Market Report" who would benefit by a publication of the averages for the calendar week, in addition to the week ended on Wednesday, we should be glad to compile and publish them. Readers who are interested in this particular matter are invited to let us know.—EDITOR.

Consultation

Analysis of Fluorspar

"I shall appreciate it if you will furnish me with a method for quantitative analysis of fluorspar."

The usual determinations for estimating the grade or value of fluorspar for commercial purposes include calcium fluoride, silica, and calcium carbonate. If in special cases it is desired to know the content of lead, iron, zinc or sulphur, analyses by standard methods will serve.

A satisfactory procedure said to be devised by E. Bidtel is printed in Scott's "Standard Methods of Chemical Analysis," as follows:

Calcium Carbonate

"One gram of the finely powdered sample is placed in a small Erlenmeyer flask, 10 cc. of 10 per cent acetic acid are added, a short-stemmed funnel is inserted in the neck of the flask as a splash trap, and the mixture is heated for an hour on a water bath, agitating from time to time. The calcium carbonate is decomposed and may be dissolved out as the soluble acetate, whereas the fluoride and silica are practically unaffected. The solution is filtered through a 7-cm. ashless filter, the residue washed with warm water four times, and the filter burned off in a weighed platinum crucible at as low a temperature as possible. The loss of weight, minus 0.0015 gram (the amount of calcium fluoride soluble in acetic acid under the conditions named), is reported as *calcium carbonate.*

Silica

"The residue in the platinum crucible is mixed with about 1 gram of yellow mercuric oxide, in the form of emulsion in water (to oxidize any sulphide that may be present); any hard lumps that may have formed are broken up, the mixture is evaporated to dryness and heated to dull redness, then cooled and weighed. About 2 cc. of hydrofluoric acid are then added, and the mixture is evaporated to dryness. This is repeated twice to insure complete expulsion of silica (as SiF_4). A few drops of hydrofluoric acid are then added, together with some macerated filter paper, and a few drops of ammonium hydroxide to precipitate the iron. The solution is evaporated to dryness, heated to dull redness, cooled and weighed. The loss of weight is reported as *silica.*

Calcium Fluoride

"The residue is treated with 2 cc. of hydrofluoric acid and 10 drops of nitric acid (to decompose the oxides), the crucible covered and placed on a moderately warm water bath for thirty minutes, the lid then removed, and the sample taken to dryness. The evaporation with hydrofluoric acid is repeated to insure the transposition of the nitrates to fluorides, and if the residue is still colored, hydrofluoric acid again is added and the mixture taken to dryness a third time; then a few drops of hydrofluoric acid are added and 10 cc. of ammonium acetate solution. (The acetate solution is made by neutralizing 400 cc. of 80 per cent acetic acid with strong ammonia, adding 20 grams of citric acid and making the mixture up to 1,000 cc. with strong ammonium hydroxide.) The mixture is digested for thirty minutes on a boiling water bath, then filtered and washed with hot water containing a small amount of ammonium acetate, and finally with pure hot water. (Several washings by decantation are advisable.) The residue is ignited in the same crucible and weighed as *calcium fluoride.* An addition of 0.0022 gram should be made to compensate for loss of CaF_2.

"Pure calcium fluoride is white. To test the purity of the residue, 2 cc. of sulphuric acid are added and the material is taken to fumes to decompose the fluoride; 1 cc. of additional sulphuric acid is added and the excess of acid expelled by heating. The residue is weighed as calcium sulphate. This is now fused with sodium carbonate, and the fusion treated with hydrochloric acid in excess. If barium is present the solution will be cloudy ($= BaSO_4$)."

Iridium and Iridio-Platinum

"Will you be kind enough to explain the difference between the price of iridium and iridio-platinum, as quoted in your market report? Is iridio-platinum a natural inseparable combination or a chemical one?"

Platinum jewelry usually is an alloy of platinum and iridium, which is much harder than pure platinum. Dealers ordinarily carry in stock iridio-platinum alloys containing 5 per cent and 10 per cent iridium. Although at times 7.5 per cent material is marketed, the standard grades are 5 and 10 per cent. The normal premium for 5 per cent iridio-platinum over soft or refined platinum is $1 per ounce; for 10 per cent iridio-platinum it is $2 per ounce.

In the trade any sponge iridium that assays above 98 per cent is considered up to standard and is good delivery, although some dealers make a product 99.5 per cent pure. The principal use of this sponge is as a material to alloy with refined platinum.

From a standpoint of quantity the use of iridium as iridium is not important.

Iridio-platinum is a true alloy—that is, a solid solution of one in the other. That it is not a chemical combination is evident from the fact that the proportions vary. Chemical unions are always effected in fixed and certain proportions.

High-Grade Zinc

"Where can I obtain slab zinc of very high grade made from (a) willemite and (b) sphalerite? Is electrolytic zinc as pure as can be purchased in large quantity?"

The New Jersey Zinc Co. is the only important producer of zinc from willemite ores in the United States. The address is 160 Front St., New York City. The Anaconda Copper Mining Co. operates the only electrolytic zinc plant in the United States, although the Sullivan Mining Co. is building a plant at Kellogg, Idaho. The source of the metal is principally sphalerite ores. Presumably none but high-grade zinc would serve your purpose.

Anaconda's electrolytic zinc is guaranteed to be 99.90 per cent and usually averages around 99.94 per cent. The impurities are cadmium and lead with no iron. The New Jersey Zinc Co. on its best brand guarantees 99.94 per cent or higher. The maximum contents of impurities are: lead, 0.05; iron, 0.01 per cent.

Slab Zinc Specifications

"Will you please give me the latest specifications of the American Society for Testing Materials on various grades of slab zinc?"

The society revised its specification in 1918, and since then no change has been made. They provide that the zinc shall be made from ore or similar raw material by reduction and distillation or by electrolysis, and not produced from reworked metal. The maximum allowable impurities in the five different grades are shown in percentages in the accompanying table. All grades shall be free of aluminum.

Specifications Showing Allowable Impurities in Slab Zinc

Figures Are Percentages

	Lead	Cadmium	Iron	Combined Lead, Cadmium and Iron
High Grade.....	0.07	0.07	0.03	0.10
Intermediate.....	0.20	0.50	0.03	0.50
Brass Special.....	0.60	0.50	0.03	1.00
Selected.....	0.80	0.75	0.04	1.25
Prime Western....	1.60	....	0.08	....

News of the Week

Summary

REPORTS of the finding of new orebodies in the Horne mine in northwestern Quebec have stimulated activity in the shares of Noranda Mines, Ltd.

Michigan iron-mining companies buy new equipment for surface and underground operations.

Capital stock of United States mining companies is estimated to exceed $7,000,000,000.

Wisconsin zinc mines are unusually active with development and production.

Senator Oddie wants $100,000 appropriation for economic work of the Bureau of Mines.

Interstate Commerce Commission denies freight rate increases on refined copper.

Deficit of the Alaskan Railroad is decreased; larger mine tonnage helps—Dredging development is becoming a feature of Alaska mining.

A. S. & R. representative in Mexico is quoted as suggesting curtailment of silver production.

Tin and tin shares stir financial circles in London—Anglo-American Corporation buys Mount Isa shares.

Concentrators active in Tri-State district total 170—Zinc concentrate sales exceed production.

Central Manitoba Will Offer 1,000,000 Shares at $1

Property at Long Lake—John Taylor & Sons Will Be Managers—$1,100,000 Ore Developed

The Central Manitoba Mines, Ltd., operating the Kitchener-Hope property at Long Lake, is issuing 1,000,000 shares of treasury stock, which is being offered to the public, through a syndicate of Toronto brokers, at $1, which is the par value. The company is capitalized at 4,500,000 shares, of which 1,189,892 are in the treasury. If the present issue is fully subscribed, practically the entire capital will be issued. The purpose of the issue is to provide funds for mill and mine construction, to electrify the mine equipment, further development of the property, add larger mine equipment, and to provide working capital.

The statement of H. A. Wentworth shows that developed ore amounts to a total of $1,100,000, the grade being $12 a ton. It is proposed to build the first unit of a mill with a capacity of 150 tons a day, with building and crushing capacity for 300 tons. A power line from the plant to the Manitoba Power Co. will be completed by Oct. 1, 1927, and an ample supply of power is assured. When the mill is completed John Taylor & Sons, of London, will assume the management.

The main oreshoot has been exposed on the Kitchener claims for a length of 900 ft., and gives an average sampling of $11.45 over a width of 5.1 ft. It has been developed to a depth of 440 ft. in the Eclipse shaft. West of the Kitchener shoot and under a swamp, two diamond-drill holes gave assays of $9.80 and $36.89 over a width of 5½ ft.; 3,600 ft. east of the Eclipse shaft the Tene oreshoot has been exposed for a length of 155 ft., where it disappears under a swamp. This ore averaged 15½ ft. wide and assays from $13 to $20. To the southeast of the Tene about 500 ft., the Rogers vein shows a short length, under a swamp, of narrow high-grade ore, from which assays up to $100 have been obtained. The ore reserves are based almost entirely on the Kitchener oreshoot, but as development work progresses on the Tene and other shoots this total should be rapidly augmented.

Ontario Gold Production for October Shows Increase

THE October report of the Ontario Bureau of Mines shows that the output of Ontario gold mines for October was 333,524 tons treated, the recovery being $2,715,485, an average of $8.15 a ton. This is an increase of $350,000 as compared with the previous month. In the Porcupine camp 283,264 tons was milled, the recovery being $2,081,231, an average of $7.35 a ton. In Kirkland Lake 50,260 tons was treated, the recovery being $634,254, an average of $12.60 a ton.

Magma Copper Has $100,000 Fire in Mine Sub-Station

The Magma copper mine, at Superior, Ariz., suffered a $100,000 loss recently when a fire, caused by an overheated transformer, destroyed the mine sub-station.

The mine recently has been operated by electric power from the Roosevelt dam. The station which was destroyed contained the transformers which stepped down the current from the power line voltage to that used at the mine. Mine operations were tied up only a few hours while the power lines were being connected with another transformer unit.

Buy New Equipment for Various Michigan Iron Mines

Crusher Plant at Volunteer—Oliver Installs Electrical Machinery at Geneva—New Headframe

Pickands, Mather & Co. have placed an order for a new Traylor crusher for the Volunteer mine, on the Marquette iron range in Michigan. This will be similar to one installed this year. It is designed to take some of the burden off the one now in use. The Worden-Allen Co. has been awarded a contract to fabricate and erect the steel for the new crusher building. The Volunteer shipped its first ore late in the season and will move about 150,000 tons from the pit before the close of navigation. Next year it is planned to mine 450,000 of low-grade siliceous iron ore. A novel feature in mining at the Volunteer is the tower control for dump cars moving from the shovels to the crushing plant. Current is supplied from a third rail.

The Oliver Iron Mining Co. has purchased additional equipment for its Geneva shaft, on the Gogebic iron range, in Michigan. This will include an electric-driven skip hoist with a 12-ft. drum, hoisting two ten-ton skips in balance from an ultimate depth of 4,000 ft. An electric-driven compressor, with a capacity of 500 cu.ft., also will be installed. There will be an underground electric tramming system and a ventilating system. The Geneva shaft is now down vertically 2,850 ft. and at 3,000 ft. a crosscut will be driven to the ore.

The M. A. Hanna Co. is to erect a new steel headframe and completely electrify its Hiawatha mine, on the Menominee iron-ore range in Michigan. There also will be a new shops building. Work will be started about the first of the year, and no mining will be carried on for a period now estimated at about ninety days.

Mines' Capital Stock Exceeds Seven Billion Dollars

THE fair value of the capital stock of all mining corporations making returns in 1924 was $7,483,691,440, according to the figures of the U. S. Bureau of Internal Revenue, just made public. Subdivisions making up that total are: Coal, $1,852,751,471; metal mining, $1,331,783,527; oil and gas, $2,389,830,113; non-metal mining, $86,790,753; quarrying, $204,634,738; other mining $1,617,900,838.

Morning Mine Highly Productive After Forty Years' Operation

At the Morning mine, owned by the Federal Mining & Smelting Co., Mullan, Idaho, the great orebody was recently cut on what will be known as the 3,050 level. This is 2,250 ft. below the operating tunnel, from which the shaft is sunk, and 4,600 ft. beneath the apex of the vein, which has been productive practically from the grass roots. The ore on this new level where crosscut is 15 ft. wide and contains 3.4 oz. of silver to the ton, 11.2 per cent lead, and 9 per cent zinc. The 2,650 level, 400 ft. above, has proved to be the best in the history of the mine, the oreshoot on this level being approximately 1,700 ft. long and probably averaging 12 ft. wide. On the 2,850 level, which is 200 ft. below, there was a marked improvement in the grade of the ore and this improvement holds good on the new level. All conditions at this great depth are favorable to continuance of the ore to much greater depth.

For the present attention will be given to developing the oreshoot on the new level and also on the 2,850. Although the mine has been continuously productive for almost forty years, today from top to bottom ore is being mined on almost every level and the output is greater than ever before.

Britannia Mills 3,300 Tons Daily

C. P. Browning, general manager for the Britannia Mining & Smelting Co., recently stated that the annual payroll of his company is $1,700,000. He said that large extensions had been and were being made, with the result that the company was producing and milling 3,300 tons of ore per day.

A long haulage tunnel now is being driven, through which ore will be conveyed from the mine to the mill. This will reduce the cost of operation, particularly during severe winters, when the expenses of keeping the outside railways clear of snow adds considerably to the cost of production.

In reply to a question, Mr. Browning said that he would be glad to see a copper smelter in operation at the coast in southern British Columbia, but he thought conditions should be studied closely before such a plant is started. His company is by far the largest producer of concentrate in the southern part of the province, but, in his opinion, it did not produce enough material to warrant the erection of a smelter.

Noranda Shares Advance on Reports of New Ore

Good Showing on Bagshaw—Freight Rates on O'Brien Branch High—Financing Too Easy?

Special Correspondence

DURING the last few days there has been a great deal of activity in the stock of Noranda Mines, Ltd., operating the Horne mine, in the Rouyn area of Quebec. The company's shares have reached a new high level of $20.50. This movement is understood to be the result of two discoveries. One of these was made while digging a sewer trench about 200 ft. south of the No. 2 shaft, where a 5-ft. vein of 6 to 8 per cent copper ore was disclosed. The most important development, however, is the location by diamond drills of an entirely unexpected orebody, at a depth of approximately 900 ft. The company is keeping this quiet for the time being, but it is understood that the ore is of high grade.

Although the railway is now completed into the Rouyn camp, it would not be surprising if part of the freight going to the camp, during the present winter, will go by way of the T. & N. O. Railway from Ontario. Walter Little, a contractor, has put on two big tractors and has as well several smaller trucks and a number of horse teams, in anticipation of heavy movements of freight from Cheminis, the present terminus of the Kirkland Lake branch, into Rouyn. The distance from Cheminis is 32 miles, and freight can be hauled into the various properties considerably cheaper than can be done under the present freight rates in force on the Rouyn branch. The railway is evidently trying to exact its pound of flesh, in the early days of its operation, as freight and passenger rates must come down if it is to perform its function.

An important discovery has been made on the Bagshaw group of claims, where a mineralized zone 45 ft wide has been opened up. Surface sampling shows from 4 to 6 per cent copper and 2 to 16 per cent zinc. Other parallel bodies have also been found, but not yet developed. An offering of $30,000 in its property was oversubscribed in a few hours in the town of Haileybury.

Developments on Alderson-McKay

On the Alderson-McKay property the drift from the 125 level of the shaft has advanced 35 ft. in the No. 3 orebody. At present the drift shows 7 to 8 per cent copper ore, having a gross value of approximately $20 a ton. The drift will be continued, with crosscuts at intervals, to determine the width. It is understood that sinking will be continued to the 250 level as soon as more power is available. In the meantime work is being continued with gasoline-driven compressors.

Companies such as the Alderson-McKay, Waite-Montgomery, Amulet, and others can put up mills at a comparatively small expense which will produce copper concentrates—marketed almost at their back door to the Noranda smelter—and zinc concentrates, which can be shipped. The problem of financing properties of real merit presents no difficulties, and as a matter of fact, in certain cases, is almost too easy.

The issue of Towagamac stock a few months ago came out at $1.50 a share, and before the certificates were delivered it was more than $3 a share, and recently sold at more than $5. It is expected that if an issue were made of the Waite-Montgomery the stock would jump very rapidly, as applications have already been received for several times the amount of any issue to be made. Rapid rises such as these sometimes prove an embarrassment, as the public has a tendency to put the stocks up to a figure which insiders do not believe is always justified by mine developments.

Arizona-Premier Passes to Bevis Divide

Control of the Arizona-Premier Mining Co., Kingman, Ariz., has been acquired by the Bevis Divide Mining Co., a Nevada corporation, Frank Manson, of Kingman, president. The Arizona-Premier, a privately owned corporation, was operating on the other end of the Banner vein to that being worked by the Comstock Silver Mining Co., of which Mr. Manson is also president. The Arizona-Premier properties consist of twenty-eight claims, and the vein system is considered as a continuation of the system extending through the Comstock Silver ground, approximately two miles away. Both the Comstock Silver and Bevis Divide are actively engaged in opening up the vein at depth.

Silver Charm Discovers Gold

The owners of the Silver Charm Mining Co., Greenwood, B. C., in prospecting and developing a vein for silver found that it contained an appreciable quantity of gold. According to report, the vein containing this ore was opened on the side of a wall that is almost vertical and several hundred feet in height. A drift was started at a point 75 ft. above the main line and siding of the Canadian Pacific Railways and has been run 82 ft., attaining a vertical depth of 250 ft. The ore is reported to average $84 to the ton of silver and lead. What the gold will raise it to remains to be seen. The gold-bearing part of the orebody is 3 ft. wide. The property is owned by H. V. Myrick and associates, of Seattle, Wash.

Compressor at Crazy Girl

The Silver Lead Metals, Inc., of Idaho Springs, Colo., which controls the Crazy Girl mine, have just installed a new compressor. It is driven by a 75-hp. motor and is capable of operating seven machines. The Crazy Girl was taken over as a mill ore producer, but recent developments are said to have opened up what is expected to be shipping ore.

Large and Small Companies Active in Wisconsin Zinc Fields

Vinegar Hill and Mineral Point Expand—Many Independent Operators in Region—Old Tailings Piles Being Worked

ZINC MINING in that portion of the Wisconsin field adjacent to Benton is unusually active. E. G. Longhenry, a geologist and mining engineer, of Chicago, recently visited the camps and observed a general resumption. The Monmouth mine, operated by the Vinegar Hill Zinc Co., is producing steadily. The property had been thoroughly drilled, and though it has a difficult water problem, the large orebody is being rapidly opened up, and production from now on should increase. Besides this mine the Vinegar Hill company is also operating the Middie and Birkett mines with good results and the Bull Moose, next door to the Middie, is being operated under a sub-lease and is proving a money maker.

Clean Up Old Dumps

The old Nightingale mill has been moved to the Badger mine, operated by local men. A drill has been started on the James Calvert place by Kistler & Stephens, of Platteville. The Hird & Harker lead mine is still producing a high-grade lead. I. N. Lee and Robert Fox are cleaning up the old dumps on the Leadmine mine, which was a wonderful producer forty years ago. They will also do some underground work at this property. The Rooney-Swift, from which the first "jack" from the field was shipped to the smelter in 1863, and which has been a heavy producer of lead and zinc for many years, is to be drilled by the owners. The old Pittsburg Benton is being drilled by the Vinegar Hill company. It also has another valuable lease near this property.

The "Do Little," which produced some nice lead ore last spring, is now being developed into a "jack" mine. This is just east of the Vandeventer on the Sullivan land. At St. Rose, Bob Fox and local parties have struck one of the largest deposits of lead ever discovered in the district. The lead occurs at a depth of 80 ft. One car of ore has been shipped and another is ready for market.

The Mullen and the James, two more of the Vinegar Hill group, are running at top speed, all of the ore being hauled through Benton to the National Separating plant. The Copeland, one of the Mineral Point Zinc mines, is producing eight cars a week, the ore going to Mineral Point. The Champion, another Mineral Point property, is turning out about six cars per week. The new Longhorn, which is just getting started, will perhaps be the banner producer for the Mineral Point Zinc Co. The lease has been thoroughly drilled and is equipped with the finest plant in the district. This company has also drilled the Silas Field farm with good results.

Lawyer Bros. are cleaning up the tailing piles at the Lucky Twelve; and Cherrey & Poppy are doing the same kind of work at the old Longhorn mine. This property has been unwatered and the operators will work on a new run of ore which seems to be a continuation of the Penna Benton. The Curwen has another shaft down. One shipment of hand-cleaned ore ran 63.70 per cent. This mine is owned by local men and is different from many other leases in that in some places it is only 25 ft. to the ore.

The Mineral Point Zinc Co. has drilled the Lyne land just east of the Winskell with very favorable results. Rispin and Temple are prospecting for lead ore on the Luke Harvey farm.

The Paris Hill, financed by Mr. Longhenry and other Chicago men, has its shaft down 84 ft. The lease adjoins the C. & N. W. railway, half a mile south of the village of Benton.

The Ida-Blende shaft is down 120 ft. and the drift is over to the "pitch." The orebody is larger and richer than the drilling showed. It is expected that the 400-ton mill will be ready to run early in December. The mill is conveniently located in the center of 300 acres of valuable mining land. Some of this land is owned by the Ida-Blende Mining Co. and the remainder is under lease. The property near the shaft has been thoroughly drilled, more than thirty holes showing ore bearing ground. The other mill on the original Ida-Blende will also be set in operation as soon as the new mill gets well under way. William Eiler is president and general manager of this company.

Lake Copper Shipments to Continue to Dec. 15

Copper shipments by boat out of the Michigan district will continue, it is expected, up to Dec. 15. Large tonnages of metal are moving, but much of it is for storage in the East, to save transportation costs. A small volume of export business has been done this month, the metal being consigned to France.

Victoria Copper Has Usable Water-Power

Investigations by water-power engineers who visited the property of the Victoria Copper Mining Co. in Ontonagon County, Mich., during the summer have led to reports that the water-power of the company will be developed. The Victoria mine has been idle since 1922. It is generally conceded that the water-power has a considerable potential value and that it could be developed into one of the largest and best in Michigan.

Shortage of power was one of the principal drawbacks Victoria had to contend with when the mine was in operation. In dry seasons, the water was so low in Lake Gogebic, the source of the water supply, that the mine could work only one shift and at times it became necessary to close down entirely.

Idaho Company Mines Manganese Ore at Good Profit

Manganese ore is being mined on a small scale by the Idaho Manganese Co. from deposits near Cleveland, Bannock County, Idaho. Twelve men are employed, according to Nathan Smith, president of the company.

The deposit consists of a series of manganese replacements in lime. Two have been developed, and surface cuts have been run on others. Approximately 900 tons of ore running from 41 to 46 per cent manganese was shipped last summer to the Columbia Steel Co. In addition, a carload lot of very high-grade ore was shipped to an electric-battery manufacturer, for which the company received $70 per ton.

There is a good market for all the manganese ore that can be produced in this section, and the high-grade ore, used in batteries, now imported at $70 to $80 per ton, f.o.b. New York, shows a profit of about $50 per ton, to the operating company above named. The company estimates that it has about 100 carloads in sight, of which about 15 per cent can be used for battery purposes.

On the property of the Cleveland Mining Corporation, of which C. C. Ames, of Pocatello, Idaho, is president, there is nothing being done, but it is said that work on this property, which adjoins the Idaho Manganese, will be started at an early date.

Consolidated Will Arbitrate Smoke Damage With Farmers

Officials of the Trail smelter, in British Columbia, have submitted a proposal in writing to residents of the district between Northport, Wash., and the Canadian boundary line, to arbitrate the question of smoke damage from the smelter and refineries. The company denies that any damage to land and crops has been done by the fumes from the great furnaces across the border, but S. G. Blaylock, manager of the Consolidated Mining & Smelting Co. of Canada, which owns the plant at Trail, went to Northport of his own accord, on Nov. 20, talked over the problem with the land owners, and said that his company is willing to pay for any established damage. He left with the citizens' committee a written proposal to adjust the matter by arbitration. A citizens' meeting will be held to consider the proposition.

Montana Labor Unions Dissatisfied

A dispatch from Butte, Mont., states that the Butte stationary engineers' union, by a vote of ten to one, has decided to withdraw from the Mine, Mill and Smelter Men's national organization, on the ground that it does not approve of the administration of William Moyer. The Anaconda and Great Falls smeltermen have also voted to withdraw. All three organizations announce that they will continue membership in the American Federation of Labor. The Montana unions have been dissatisfied for some time with the national organization.

Teck-Hughes Mine Manager Gets Novel Bonus

SELDOM do mine managers receive a commensurate reward for the development of a profitable mine, so it is pleasing to record the action taken by the directors of the Teck-Hughes Gold Mines, Ltd., when in renewing the contract of D. L. H. Forbes, the manager, for another three years. They gave him the option to purchase 10,000 shares of stock a year at $1 a share. As this stock has a market value of almost $5 at the present time, Mr. Forbes' reward will be substantial, but is generally conceded to be well deserved. The mine is one of the big producers in the Kirkland Lake district, in northern Ontario.

Think Asbestos Mine Waste Valuable as Fertilizer

It is announced that a new use has been found for the great quantity of waste material produced at the asbestos mines in the Thetford district, in Quebec. Experiments have proved that this has value for agricultural purposes, supplying some constituents lacking in much of the soil in eastern Canada. Tests conducted at the MacDonald College by the Milton Hersey Co., of Montreal, show that a distinct effect is produced on certain types of soil by the application of this stone. MacDonald College has undertaken to make further investigations, and the question is also being studied by the authorities of the Dominion experimental farm and by the Provincial Department of Agriculture at Quebec. P. C. Armstrong, who discovered the value of this material as a fertilizer, has been retained by the Asbestos Corporation of Canada to continue his researches.

Dome Drills 22-Ft. Orebody; No Assays Yet

The winze below the fifteenth level of the Dome Mines of Porcupine has reached the eighteenth level, at a depth of over 2,300 ft. A station was cut on the seventeenth level, where a diamond drill is working, but the main development will be carried on from the eighteenth, which will be just under the diamond-drill intersection secured some months ago, which showed 33 ft. of $13 ore. A station and ore-pocket are now being cut and development work will soon be started.

A few days ago a diamond drill cut 22 ft. of good-looking ore, from which assays have not yet been made public. This is believed to be the same body mentioned above and is a further confirmation of its possibilities. The company is also driving a long crosscut on the sixteenth level, to the far-west boundary of the property, and in this work a 3-ft. vein has been intersected. This is not of great importance to the Dome, as what the company needs is tonnage; but it is significant as it was found in the Keewatin.

Dredging Development Feature of Alaskan Mining Activity

U. S. Smelting Company's Boats Have Good Season at Nome—— New Roads Being Built

IN general, mining conditions in Alaska are quiet, although some notable developments, mainly in placer mining, are under way. The Fairbanks Exploration Co. is doing the first real systematic development for large-scale dredging that has been done in Alaska. It is an example of good engineering and efficiency in a country of adverse conditions. A maximum of 850 men was employed this summer. About ten million dollars will be invested before one cent is taken out of the ground. It will be 1928 before a dredge will be in operation, pending the construction of an 80-mile ditch, already 60 per cent completed. Though the stripping of the overburden has so far been confined mainly to the more favorable areas, some very good results have been obtained, considering that only the small local water supplies were available for this work. A 6,500-kva. steam turbo generator power plant is under construction and Healy coal is to be used for fuel—about 20,000 tons per year. Goldstream and Cleary Creeks are the present objectives and have been well prospected, showing a large yardage of ground averaging 40 to 50c. per cubic yard, and a much larger yardage when ground as low as 30c. is included. According to Mr. George Metcalf, the manager, it is estimated that the investment will be amortized by 1947, and then still have Ester, Dome, Little Eldorado Creeks to dredge. The results of this season's work make the prospects look much better, although there is a large investment and many difficult problems remain to be worked out.

The four Hammon dredges—now operated by the U. S. S. & R. Co.—had a good long season at Nome. They account for the large increase this season in the placer-gold production from the Seward Peninsula,which total showed as about $1,800,000, of which about 85 per cent or more was produced by the nineteen dredges operated there. The Hammon operation at Nome is, however, a salvaging operation, and may never pay. The ground is too low grade, there is not enough of it, and operating conditions are difficult and costly.

65 Per Cent of Gold Dredged

In the interior, fourteen dredges were operated, and though the total placer-gold production for all of Alaska will show little change—maybe a little more—from last year, fully 65 per cent of it was produced by the dredges. The other operations were greatly handicapped by the prolonged drought and other unfavorable conditions. Drift mining is almost past and most of the hydraulic plants are operating under difficulties. The dredges are by no means having an easy time of it either; most of them keep operating only because the investment is there and they have to keep going.

A little lode development was done in the interior and in the coastal districts, mainly South East Alaska, but none of them afford any large possibility.

New roads are proving invaluable in the opening up and development of the mineral territory in the interior of Alaska. The new road out of Gulkana, which was pushed out twenty miles last summer and eventually will be constructed on to the Chistochina River, already has doubled the tonnage that is being taken in and increased the activities there greatly. The Alaska Road Commission has been especially efficient in construction work there, and because of the fact that the country is an easy one to go through, has been able to make quick progress. The road will be 36 miles long when completed.

Report Favorable Development at Katherine Mine, in Arizona

Development work at the Katherine Gold mine, north of Kingman, Ariz., is resulting in a steady increase of ore reserves. Several veins are said to have been cut as the shaft progresses downward. On the third level the orebody is reported to have widened out. Another vein has been followed about 100 ft. averaging $15.

The management is planning to step the mill up to 500 tons daily as soon as lateral work from the 800 enters the veins and the development has been started. One day shift in the stopes readily keeps the mill more than supplied with ore, this being hoisted to surface on the day shift. A 60-hp. hoist is installed on the 400 level, and a pocket has been put in.

Flin Flon Has Sources of Hydro-electric Power

Adequate hydro-electric power will be obtainable for the operation of the Flin Flon mine, in Manitoba, where a test concentrator is now being completed.

In the summer of 1925, while examining the Flin Flon deposit, representatives of the present owners realized that power was an important question, and consequently investigated the situation thoroughly. A power site with ample possibilities of power development was found on the Churchill River, and subsequently a priority permit was applied for from the Canadian officials and issued by them. This is still in effect and solves the power requirements of the mine.

La Plata Consolidates Colorado Mines

La Plata Mining Co., of Durango, Colo., has purchased and consolidated several properties in the California district 17 miles northwest of Durango. This company has spent more than $100,000 in development work around Durango in the last three months.

News From Washington

By PAUL WOOTON
Special Correspondent

Senator Oddie Militant on Mines Bureau Appropriation

Will Fight for $100,000 for Economic Work on Metals and Minerals—Fears Budget Officials May Ignore Industry

If adequate provision is not made in the estimates of departmental expenditures for the economic work of the U. S. Bureau of Mines, to be presented to Congress Dec. 6, Senator Oddie, chairman of the Senate Committee on Mines and Mining, will appeal to the friends of the mining industry in Congress to override the budget. No less than $100,000 should be provided for this new work, Senator Oddie believes. He points out that there long has been need for federal studies dealing with the business side of mining, but now that they had been requested formally by a committee representing all branches of the mining industry, there can be no good reason why a respectable start on such work should not be made next year.

The Nevada Senator calls attention to the fact that Washington is a great clearing house of information regarding any agricultural commodity. He has found from experience that no government agency is in a position to give information concerning the current situation surrounding the metals or to interpret developments in that field.

Judging from certain things which have happened in the past, Senator Oddie would not be surprised if some zealous budget official, incapable of grasping the fine conception of extending to mining some small proportion of the splendid economic service rendered by the government to agriculture, should have applied the ax to this particular item.

The Department of Agriculture has a great bureau devoted solely to the consideration of economic matters affecting farming. The late Secretary Wallace declared that money expended in that work paid an annual dividend of 1,000 per cent to the American people. Senator Oddie feels that in view of the manifold benefits which have come to agriculture as a result of such work, it should not be withheld from the mining industry. As the chairman of the Committee on Mines and Mining, Senator Oddie would be looked to for leadership in such a matter. Immediately on learning of the situation, on his return to Washington, he let it be known that he is more than willing to assume the responsibility. Representations on the subject already have been made to the Appropriations Committee.

Alaska Railroad Reduces Deficit as Tonnage Increases

A reduction of $504,795, or 30 per cent, in the annual deficit of the Alaska Railroad during the fiscal year of 1926 is shown in the annual report of its general manager submitted to the Secretary of the Interior. The deficit for 1926 amounted to $1,169,202, as compared with $1,673,997 for the year of 1925. According to the report, the revenues of the road increased during the year by $206,274.63 while the annual maintenance and operation cost including replacements was reduced over the preceding year by $298,520.69. A reduction of $136,480 was effected in the road's payroll. During the year the report states that steel bridges have supplanted trestles or wooden bridges at a number of places along the line, trestles have been filled in, cuts have been widened, and banks have been riprapped to prevent flood damage. The most notable addition to equipment was the purchase of a Brill 75 gas car, the operation of which during the summer season eliminated the use of one steam train during the summer between Seward and Fairbanks.

The report states that the general policy of the Alaska Railroad remained unchanged during the year. This policy calls for the completion of the railroad and the purchase of modern equipment at an estimated cost of $11,878,781. With the expenditure of this sum the cost of operation and maintenance, which now stands at a high figure, will be reduced to a normal outlay annually. Because appropriations so far made have provided only $1,865,000, including $500,000 available May 10, 1926, the greater part of the construction work proposed to complete the road has not been done.

Commercial freight on the rail line, exclusive of coal, amounted to 32,483 tons, an increase of 7,044 tons over the previous year, the report states. Coal tonnage for the year was 32,553, an increase of 4,127 tons. The total commercial tonnage hauled over the road for 1926 was 65,036, or a gain of 11,171 tons. The number of revenue passengers transported over the road was 57,567 in 1926, an increase of 9,267 over 1925. The increase in tonnage was due to increased shipment of mining machinery and supplies for mining operations into Alaska. There was also a general increase in shipments.

Reservation of a tract of public land along the right-of-way of the Alaskan Railroad for the purpose of supplying timber to the road was revoked in an executive order issued recently. The tract includes a strip of public land five miles wide on each side of the railroad extending from Seward, Alaska, to the Knik River.

I. C. C. Denies Freight Rate Increases on Refined Copper

Producers and Other Protestants Win —No Increase in Rate to Brockville, Ontario

Proposed increases in certain freight rates on ingots of copper, brass, and bronze and on pigs, scrap, and related articles of the same metals have been denied by the Interstate Commerce Commission. Commissioner Hall dissented and expressed the opinion that he is "unable to see why copper should be kept on a lower basis than iron and steel, to say nothing of the other fifth-class articles of less value than copper."

The increases which the carriers proposed to put into effect were in purported compliance with an earlier opinion of the commission. Representatives of the virgin copper producers, of the National Association of Waste Material Dealers, of the Federated Metals Corporation, and of the Norfolk Smelting Co. contended that the increases were not in line with that decision.

The commission finds that "a rate of 27c. would be reasonable for application on the fifth-class articles under consideration between New York and points in the 60 per cent group, including Pittsburgh." It also finds that the rates proposed to and from Norfolk have not been justified.

The commission upheld the contention of the copper producers and the other protestants that the proposed rate from New York to Detroit be applied from New York and Baltimore to Brockville, Ont. The carriers wanted to increase that rate 38 per cent.

Grindings of copper and brass should be classified with residues for rate-making purposes, the commission holds, rather than as borings and turnings, which take a higher classification, as the carriers proposed.

Plan Operation of Gold Properties at Elk City, Idaho

The Stowell Gold Mining Co., of Spokane, has been formed to handle what is known as the South Fork property, 7 miles west of Elk City, Idaho, on the route of the state highway, which is being slowly built into that district. W. H. Stowell, president of the company, is a pioneer assayer of Spokane and at an earlier date was in the business in Nevada. The mine is said to have produced $200,000 in gold bullion and concentrates and to have 30,000 tons of ore blocked out. There is a five-stamp mill on the property.

Copper Payroll Increasing

The labor situation in the Michigan copper district is improving steadily. Calumet & Hecla is signing up about forty men a week, the majority of them coming from the industrial centers, and other companies also are increasing their underground forces. All of the mines are in need of men and glad to give employment to those laid off in the automotive centers of the state. Many of the men formerly worked in the district and are experienced.

London Letter

By W. A. Doman
Special Correspondent

Tin and Tin Shares in the Foreground—Developments at Wiluna Encouragnig

London, Nov. 16—While the statistical position of tin is quite sound and likely to remain so, judging by information obtainable, speculators have, as I mentioned a week or so ago, again been hit rather badly in one or two directions. When tin prices were soaring the promoters of new issues were playing on an optimistic note, and the chairmen of some of the companies whose meetings have been held naturally were not backward in painting the prospects in beautiful colors. As I have before remarked, it is in many cases the share market and not the mining position that has been kept in mind. Tingha Hydraulic Tin (N.S.W.) shares have suffered a heavy fall on an official statement in which the managing director points out that the output is likely to be below that which it was originally anticipated might be reached by this time. It is now officially stated that some considerable period must elapse before areas recently acquired are worked out and sluicing operations concentrated on the original area. Another company whose shares have been skyrocketing is the Tavoy, and, sympathetically with the Tingha, these have had a fairly heavy drop.

The Bisichi Tin Co. (Nigeria) is still unhappy with the working of its dredge. Early in the year there was no doubt, from dredging already completed, as to the capacity and ability of the suction cutter dredge to fulfill expectations. In June the consulting engineers pointed out that the dredge had been strained through encountering a belt of stiff clay. New cutters have arrived at the property, and it is hoped that matters will soon improve. The fluctuations in the tin share market—and at the time of writing this is distinctly dull—are largely due to the fact that while the technical position is so strong some of the producing companies have not yet reflected it in their financial position.

Further information has come to hand from the Wiluna (Western Australia) property. Several hundreds of feet have been driven north and south at the 200 and 290 levels, and though values are erratic they are, on the whole, most encouraging, and from the information available to date it would appear that they average something like 40s. a ton throughout the mine. Work is actively proceeding.

The Anglo-American Corporation has taken a share interest in the Mount Isa Mines, Ltd., an Australian company owning mines of silver, lead, and zinc in Queensland, and has purchased 50,000 shares of £1 each at par. The corporation is dispatching engineers to make an examination, and if they confirm reports the corporation will acquire a further 550,000 shares at par, and assume full control. For this purpose Mount Isa Mines is increasing its capital to £1,500,000.

Three or four well-known mining engineers have formed the Glenelg Gold Syndicate, which is working a property 50 miles south of the Southern Cross. I believe that the Consolidated Goldfields has a fair interest in the undertaking. The outcrop has been tested at points 270 ft. apart, and twelve tons of ore have yielded 104 oz. of gold. Two shafts are now being sunk a distance of 260 ft. apart to intercept the reef at a depth of 60 ft. The members of this small syndicate regard the position very hopefully.

Mexico City Letter

By W. L. Vail
Special Correspondent

Restriction of Silver Output Suggested—Production of Lead Higher

Mexico City, Nov. 15—The official agent and representative of the American Smelting & Refining Co., Ricardo de la Mora, suggests, as one step toward ameliorating the condition of silver miners in Mexico, a considerable restriction in the output. In his opinion this would not only conduce toward a betterment in prices but would avoid the necessity of working out the high-grade reserve ores in many of the mines and thus depleting the properties. The suggestion is being generally discussed among mine operators.

Lead production for the first eight months of this year amounted in round numbers to 54.000,000 pesos in value, as against 45,000,000 pesos for the corresponding period of last year. Copper production showed an increase of over 2,000,000 pesos in values for the same periods. There appears to be an intensification of work, particularly in those camps where the silver ores carry high lead values.

It is reported in the local press that the Concheno Mining Co., State of Chihuahua, is preparing to work full capacity after the first of the new year. Large sums have been expended on exploration work during the present year.

La Dura Mining Co., State of Sonora, district of Alamos, has suspended operations because of the Yaqui activities, throwing over 500 miners out of employment.

Following the example of several mining companies, the Calera Mining Co. and El Potosi Mining Co. have renounced all claims for damages against the Mexican Government growing out of revolutionary activities and bandit raids.

The new flotation plant at the La Fe, State of Zacatecas, is operating, and the Santa Ana and Bilboa mines are being worked. W. O. North is superintendent.

La Noria, Zacatecas, has a new superintendent, William Locke, formerly with the Mexican Corporation at Fresnillo.

It is reported that the properties of El Favor Mining Co., State of Sonora, have been turned over on a ten-year lease to the Tigre Mining Co.

Johannesburg Letter

By John Watson
Special Correspondent

Sub-Nigel Netted £124,301 In Fiscal Year—Warning to Government by "Cape Argus"

Johannesburg, Oct. 26—The directors of Sub-Nigel, Ltd., issued a report to shareholders on Oct. 20. The company recently leased 2,373 claims on the farm Grootfontein. The profit on working, for the year ending June 30 last, amounted to £124,301. Average recovery was 13.558 dwt. fine gold per ton of ore milled, and the average stoping width was reduced from 35.9 in. (the previous year's figure) to 26.4 in. for the current year. The ore reserve fully developed is estimated at 731,000 tons, of an average value of 17.5 dwt. over an estimated stoping width of 28 in. This is an increase over last year's figure of 222,000 tons, the value being higher by 5.3 dwt. and the stoping width lower by 11.2 in.

Under the terms of the accepted tender, the company is allowed four years in which to carry on development work in the southern portion of the lease area before deciding whether the sinking of another shaft is warranted.

Platinum Disappointing

The directors of Transvaal Platinum, Ltd., issued a circular to shareholders on Oct. 21, embodying a report from the company's consulting engineer, W. J. Gau. The results of milling ore, from the farm Welgevonden, show a low average recovery on a grade of 5 dwt. and under; the extraction of 52 per cent, indicated as the result of experiments on 10-dwt. ore, was approached only on the August test run on 491 tons of 6.1 dwt. ore, which gave a recovery of 49.7 per cent. Development results throughout both sections of the mine during the year have been very disappointing.

A special correspondent of *The Cape Argus* recently wrote a series of articles on "The Shadow Over the Rand," in which he utters a grave warning against the danger of any policies, on the part of the present government, tending to increase working costs and therefore to shorten the remaining life of the gold-mining industry. Nothing is yet in sight to compensate South Africa for a shrinkage of the gold output, and it is of the greatest importance that that shrinkage should be as slow and gradual as possible.

Diamonds are still being found in patches in the Port Nolloth district, in Cape Province. The latest find was at Buchuberg, toward the mouth of the Orange River, on the coast.

On the Johannesburg Stock Exchange during the last week leading shares have declined, somewhat owing to heavy selling orders from London and Paris. Government areas dropped 3s., from 162s. 6d. to 159s. 6d.; New Modders fell 6d. from 99s. 9d. to 99s. 3d.; Crown Mines fell 1s. from 67s. 6d. to 66s. 6d.; Potgietersrust platinum fell from 8s. 1d. to 7s. 11d.

Active Concentrators in Tri-State District Total 170

Concentrators operating in the Tri-State zinc-lead district numbered 170 in the third week of November. This was an increase of three over the figure for the preceding week, and still further names are expected on the active list soon. Zinc concentrate sales exceeded production and reduced unsold stocks in the hands of producers to less than 10,000 tons. Operators consequently are optimistic.

The active companies are shown in the following table of ore shipments for the week ending Nov. 20, and total shipments for the year to date, as compiled by Frank Eberlee in the *St. Louis Globe-Democrat*.

OKLAHOMA

Company	Tons Zinc	Tons Lead
Acme Lead & Zinc	131	....
Adams Lead & Zinc	73	....
Admiralty Zinc	463	32
American Zinc	287	....
Anna Beaver Mines	596	61
Barnsdall Zinc	152	....
Bilharz Mining	341	33
Birthday Mining	38	....
Century Milling	46	....
Century Zinc	350	160
Childress Lead & Zinc	250	33
Commonwealth Mining	45	....
Consolidated Lead & Zinc	326	285
Cortez-King Brand Mining	180	46
Crystal Mineral Trust	44	....
Eagle-Picher Lead	1,188	865
Federal Mining & Smelting	1,277	....
Goldenrod Mining & Smelting	1,033	126
George M. Mining	46	....
Horine Milling	42	....
Just Right Mining	54	....
Kitty Mining	151	....
Laclede L & Z	....	45
L. & G. Mining	152	....
Mahutska Mining	45	....
Mary Ann Mining	91	....
Moyer Mining	85	....
New Chicago Mines Corp'n	976	....
Okla-Woodchuck L & Z	207	....
Oko Mining	70	....
Ozark L & Z	33	....
Quapaw-Tom L. Mining	89	....
Ramage Mining	232	....
Rainbow Mining	45	....
Rialto Mining	90	86
Santa Fe Mining	47	....
Skelton Lead & Zinc	1,206	....
Smith-Davis Mines	....	45
St. Louis S & R	44	....
Theurer Milling	45	....
Tri-State Mining	134	....
Tulsa Lead & Zinc	265	....
United Zinc Corporation	143	....
Vantage Mining	91	....
Van Buren Mining	44	....
Velie-Lion Mining	310	96
Vinegar Hill Zinc	194	76
Unclassified sales	179	....
Totals	11,930	1,489

Value—Zinc, $563,100 (5,484 tons); lead, $154,310 (1,489 tons). Total value, $717,410.

KANSAS

Andrew Brothers Mining	40	....
Barnsdall Zinc	80	....
Black Eagle Mining	55	....
Boska Mining	93	....
Blue Pigeon Milling	26	....
Butte-Kansas Mining	663	....
Century Zinc	....	47
Cherokee Lead & Zinc	231	....
Childress Lead & Zinc	313	....
Conico Mining	27	....
Commerce Mining & Royalty	495	....
Consolidated Lead & Zinc	315	102
Cortez-King Brand Mining	356	44
Crestline Products	115	....
Eagle-Picher Lead	383	144
Dayton Zinc	42	....
Euterpe Mining	131	....
Federal Mining & Smelting	434	....
Goldenrod Mining & Smelting	140	220
Grasselli Mining	131	....
Harrington Mining	33	60
H H & H Mining	32	....
Hutheon Mining	258	....
Kansas Explorations	514	182
Quapaw-Chubb Mining	178	....
Southern Lead & Zinc	150	....
Tar Creek Mining	122	....
Vantage Mining	....	46
Vinegar Hill Zinc	127	....
Totals	5,484	845

Value—Zinc, $265,570 (11,930 tons); lead, $887,320 (1,489 tons). Total value, $352,890.

Anaconda Mechanics Make Quick Work of Hoist Repair

ACCORDING to announcement made by the general superintendent of mines of the Anaconda Copper Mining Co., on Nov. 16, operations at the Leonard mine of the company were resumed on that date. On Oct. 29 the mine was shut down, owing to the breaking of the central shaft on the electric hoist. The company's repair crew established a record in the rapidity with which the large machine was again made available for operation.

MISSOURI

Admiralty Zinc	46	....
American Zinc	158	....
Barbo Mining	102	....
Black Cat Mining	45	....
C. & S. Mining	30	42
Eagle-Picher Lead	93	....
Federal Mining & Smelting	....	83
Grasselli Mining	91	....
Joalamo Mining	61	....
Kansas Explorations	190	....
Log Cabin Mining	....	33
Napoleon Mining	70	....
Riverside Mining	30	....
Unclassified sales	30	88
Totals	946	246

Value—Zinc, $41,580 (885 tons); lead, $24,600 (844 tons). Total value, $68,090.

Week's Total

Metal	Tons	Value
Zinc	18,360	$870,250
Lead	2,580	266,280
Total	.....	$1,138,390

Year's Total

Metal	Tons	Value
Zinc	758,379	$37,096,370
Lead	141,619	12,402,280
Total	.....	$49,542,840

Lincoln Mine Has High-Grade Silver Ore

A remarkable discovery of high-grade silver ore has been made at the Lincoln mine, Wallace, Idaho. The mine is developed by a crosscut 4,000 ft. long, from which the vein has been extensively explored, including a shaft following the vein to a depth of 450 ft. Plans contemplate sinking the shaft 500 ft. deeper, but in the meantime a crosscut was started from the 450 level to the south vein, which was reached in about 60 ft. The discovery was made almost coincident with the passing of the control of the Lincoln Mining Co. to James Hamilton, of Detroit. Under the new ownership direction of operations at the Lincoln has been placed in the hands of Stanley R. Moore.

State Mine Inspection Opposed

Agitation for state inspection of mines, following the Barnes-Hecker iron mine disaster at Ishpeming, Mich., and the near-disaster in the G Pabst mine at Ironwood, does not meet with approval in the Lake copper district, which sees no advantage in the plan. The Michigan copper district is relatively free from conditions such as caused caving at Ironwood and Ishpeming. Everything possible is done to make the mines safe. Highly trained, efficient engineers are employed, and the shafts are well equipped with safety avenues and devices as well as powerful electric pumps.

Hewer Developments in Idaho Look Good

The Hewer mine, on Pend Oreille Lake, in nothern Idaho, since September has sunk its shaft from the 200 level to the 500, and is now continuing 200 ft. deeper, expecting to finish the work by Christmas. On the 500 level a crosscut has been run which at 39 ft. cut an orebody 36 in. wide which is said to average 23.25 oz. silver and 1.1 per cent lead. Passing through a 10-ft. horse beyond this ore, another orebody was cut 4½ ft. wide. Exclusive of several high grade seams, the ore across the 4½ ft. averages 9.9 oz. silver and 2½ per cent lead.

When the additional 200 ft. of depth is attained stations will be cut and the ore will be opened on the lowest and intermediate levels, with the expectation that about April 1 it will be possible to resume operation of the mill. Dan Drumheller is manager.

Whitedelf Ships Lead-Silver Ore

The last two carloads of ore from the Whitedelf Mining Co.'s property at Clark Fork, Idaho, contained 49.9 oz. of silver and 34.8 per cent lead, according to Compton I. White, chief owner. From the property the leasers have shipped nineteen carloads and the company has shipped one carload. The company is asking for a favorable railroad rate for the milling ore from Clark Fork, to Troy, Mont.

Leasers of the upper workings have drifted on ore 250 ft. and are within 50 ft. of the end of their line. They report good ore 18 in. wide.

On a lower level the company has drifted from an 80-ft. crosscut 585 ft. on high-grade ore 18 in. wide. Mr. White says at the end of this the men encountered what appeared to be a fault and beyond it found good ore.

Ample Power Available for Ontario Mines

According to reports from northern Ontario, the power requirements of the mining districts will be met this winter without the difficulty which has been encountered in past years. The Porcupine camp is now well fortified against dry seasons, as power is available from the Quinze. Water storage facilities of the Northern Ontario Light & Power Co. are now in a much better position, owing to the new storage dam, which has raised the water of Lady Evelyn Lake several feet. Three plants on the Mattagami River and the Quinze plant, in Quebec, supply the energy necessary to the operations in the Porcupine camp. The Quinze plant supplies Gowganda, and a transmission line from it has been built to Rouyn. The Northern Ontario Light & Power Co. also supplies the Cobalt, Kirkland Lake, South Lorrain, and Boston Creek camps. An additional 3,000 hp. will soon be available for the Kirkland Lake camp from the Indian Chutes plant, which was built by the Great Northern Power Co. This plant is delivering only enough power to keep the pumps operating at the Night Hawk Peninsular mines.

People You Should Know About

J. R. Hobbins, vice-president of the Anaconda Copper Mining Co., is now in New York.

Charles Janin, mining engineer, of San Francisco, has just returned from a business trip to New York.

J. C. Brumblay, ore-purchasing agent for the Mason Valley Mines Co., was in Salt Lake recently on business.

Scott Turner, director of the U. S. Bureau of Mines, was recently in San Francisco visiting Bureau stations.

H. C. Bacorn, accompanied by Mrs. Bacorn, of Jardine, Mont., was in Wheeling, W. Va., last week, and spent the week-end in New York.

P. H. Miller, of Homestead, Ore., vice-president and general manager of the Silver Bell Mining & Milling Co. at Mineral, Idaho, is in New York.

A. C. Spencer, of the Geologic Branch of the U. S. Geological Survey, left Washington on Nov. 27 for Panama and will be away until early in January.

Downie D. Muir, Jr., manager and vice-president of the United States Smelting, Refining & Mining Co., recently attended the Goldfielders' Reunion at Reno.

G. E. Harrison has resigned as manager of mines in Michigan for the Corrigan, McKinney Steel Co. and will move the first of the year from Crystal Falls to Minneapolis.

Thomas C. Baker, general manager of Comstock Merger, Inc., is going to Fresnillo, Mexico, where he will have charge of operations at the company's property at that place.

A. J. Walton, general manager of the Crown Mines, with Mrs. Walton and their children, reached Capetown, on Oct. 25, after a six months' visit to the Continent and Great Britain.

Edgar L. Newhouse, Jr., assistant to the vice-president of the American Smelting & Refining Co., visited Salt Lake City during November on his regular inspection trip.

Walter Fitch, Sr., president, and **Thomas Carmichael**, secretary, of the Chief Consolidated Mining Co., have returned to Salt Lake from a business trip to Washington, D. C.

A. M. Tweedy, resident manager of the South American Development Co., Guayaquil, Ecuador, is visiting friends in San Francisco and will leave in the near future for New York.

Thomas Prior, of the staff of John Taylor & Sons, of London, has returned to England, after an inspection of the Central Manitoba Mines, in which his company in heavily interested.

Gordon Wilson, who is interested in the San Vicente mines, in Sinaloa, Mexico, has just returned to these properties after a six months' business and pleasure trip in the United States.

J. O. Elton, manager of the International Smelting Co., recently visited Rico, Colo., where he went to watch the beginning of operations at the company's new 250-ton selective-flotation mill.

Sir Robert Kotzé, the retiring Government Mining Engineer (Union of South Africa), is to accept a portrait of himself from the Associated Scientific and Technical Societies in Johannesburg.

A. G. Mackenzie, secretary of the Utah chapter of the American Mining Congress, recently visited New York and Washington, D. C., on a business trip to attend the meetings of the American Mining Congress.

George J. Young

George J. Young, of San Francisco, associate editor of *Engineering and Mining Journal*, has arrived in New York to supervise the production of the Annual Review Number of *Engineering and Mining Journal*, which will be published on Jan. 22, 1927.

Dorsey A. Lyon, chief metallurgist, and **O. A. Ralston**, assistant metallurgist, of the U. S. Bureau of Mines, visited the Salt Lake station during November and then went on to the Coast.

Fred Price, manager of the Rico Argentine Mining Co., recently visited Rico, Colo., to inspect progress of work at the Rico Argentine mine and to be present at the beginning of operation of the new selective flotation plant of the International Smelting Co.

Imer Pett, general manager, and **Thomas P. Billings**, general superintendent, of the Bingham Mines Co., have left Salt Lake City on a business trip to visit home officers of the company at Boston and to attend the American Mining Congress at Washington.

H. Warington Smyth, secretary to the Union Department of Mines and Industries (South Africa), has recently been on an official visit to Capetown. He called at Kimberley, on his return, for the conference of the Associated Chambers of Commerce, and arrived in Pretoria on Oct. 15.

U. C. Tainton has just returned from abroad, where he closed negotiations with European interests for the aquisition of rights in his patents involving the electrolytic treatment of zinc ores. Mr. Tainton is on his way to Kellogg, Idaho, to supervise the erection of the new electrolytic zinc plant being built by the Sullivan Mining Co., which is the company operating the Star mine, owned jointly by the Bunker Hill & Sullivan and Hecla companies.

J. H. Lang, one of the foremost authorities on tin, has resigned from the American Metal Co., with which organization he had been associated since its amalgamation with the L. Vogelstein interests, in 1921. His service with the Vogelstein company and with the American Metal Co. covered a period of twenty years. No plans have been announced as to Mr. Lang's further professional activities.

Obituary

Cyrus W. McArthur, for thirty years a mill builder in Colorado, died recently in Vancouver, B. C., at the age of fifty-eight.

A. S. Ross, who twenty-five years ago was prominent in Idaho and Utah mining circles, died in Philadelphia on Nov. 15. Mr. Ross organized the Pittsburg-Idaho Mining Co., and the Wilbert Mining Co.

William H. Alexander, mining engineer, died in New York City on Nov. 15. He was in his fifty-fourth year. Mr. Alexander was a member of the A.I.M.E. and was president of the Lane Rincon Mines, Inc., of Mexico.

William J. Spaulding, age fifty-one, former master mechanic of the Copper Queen branch of the Phelps Dodge Corporation, and a resident of the Bisbee district for the last twenty-three years, died recently at his home in Warren, Ariz.

Benjamin D. Phillips, a Montana pioneer, and president of the Ruby Gulch Mining Co., operating at Zortman, and of the August Mining Co., at Landusky, both in Montana, died recently in Oakland, Calif. He was sixty-nine years old.

R. F. Barker, managing director and supervising engineer of the Malaysian Tin Lands, Ltd., operating at Ipoh, Federated Malay States, died suddenly at that place recently, according to advices received by the directors of that company in Melbourne, Australia.

Charles S. Herzig, mining engineer, died in Wallace, Idaho, on Nov. 17. Mr. Herzig was a graduate of Columbia School of Mines (1895) and was for many years on the staff of Herbert Hoover when Mr. Hoover was identified with the Bewick interests, of London. He had been professionally interested in enterprises in Australia, India, Asia Minor, Africa, and South America, as well as with mining developments of the United States. Mr. Herzig was fifty-two years old.

Dr. Frank Hall Knowlton, geologist and paleontologist of the U. S. Geological Survey, died on Nov. 22 at Ballston, Va. He was sixty-six years old, and had been connected with the Survey and the National Museum for forty years. Dr. Knowlton was born in Brandon, Vt., and was a graduate of Middlebury College with the degrees of B. S., M. S. and Sc. D., honorary. He held the degree of Ph. D. from George Washington University. He was the author of many volumes describing fossil plants, and his volume, "Plants of the Past," is in course of publication.

Societies, Addresses, and Reports

American Mining Congress Announces Program for Washington Meeting

Next week in Washington the American Mining Congress will hold its twenty-ninth annual convention at the Mayflower Hotel. The meeting will be opened at 10 a.m. on Monday, Dec. 7, and will adjourn at noon on Friday. The general topic at the opening session will be "The State of the Industry." Dr. E. W. Parker, of the Anthracite Bureau of Information, will talk on the anthracite branch of the industry; Walter Barnum, of the National Coal Association, on the bituminous branch; Frank M. Smith, of the Bunker Hill & Sullivan smelter, on lead; J. D. Conover, on zinc; W. Mont Ferry, on silver; a representative of the Lake Superior Iron Ore Association on iron; and H. T. Edgar on non-metallics.

Mondell to Discuss Public Lands Control

"Politics and Natural Resource" will be the topic at Tuesday's session. Among the speakers will be F. W. Mondell, former representative from Wyoming, who will talk on "Further Disposition and Control of Our Public Lands"; Senator Lawrence C. Phipps, of Colorado, on "Our Oil-Shale Industry"; and Judge Nathan B. Williams, of the National Manufacturers' Association on "A Sensible Application of our Anti-Trust Laws." A speaker yet to be announced will talk on "The Growing Tendency Toward Centralization of Government in Washington."

"A Unified Labor Program" will be the topic at another session at which Secretary of Labor Davis is expected to speak. Cleveland Dodge, of the Phelps Dodge Corporation, will talk on "Labor Relations in Metal Mining." At the fourth session "Stabilizing Metal Production" will be the topic discussed; speeches will be made by S. S. Tuthill, of the American Zinc Institute, who will talk on "Our Lead and Zinc Industry"; by Robert E. Tally, of the United Verde Copper Co., on "A Stabilized Mineral Industry"; and by William A. Willis, of the Copper Brass Research Association, on "Promoting and Expanding Future for Copper."

Two Sessions on "Taxation"

"Taxation" will be the topic of the session on Thursday morning. There will be four speakers—namely, L. R. Gottlieb, economist, whose subject will be "Lurking Dangers in State and Local Finance"; A. G. MacKenzie, of Salt Lake City, who will speak on "The Value of Tax Payers' Associations in Solving State and Local Fiscal Problems"; George E. Holmes, on "What Is the Matter With Our Present Federal Income Tax System?"; and Walter A. Staub, on "Waivers, Credits and Refunds." Continuing the discussion in the afternoon, McKinley W. Kriegh will talk on "The Task of the Congressional Joint Committee on Internal Revenue Taxation"; H. B. Fernald on "Discrimination Against Corporations Under Present Income Tax Rates"; and J. G. Korner, Jr., chairman of the U. S. Board of Tax Appeals, on "The Function and Operation of the Board of Tax Appeals." Part of the afternoon will be devoted to three-minute talks on "What Taxpayers Think of the Present Income Tax Law and System of Administration."

At the final session the topic will be "Elimination of Waste Through Standardization." Colonel Warren R. Roberts will give a brief review of what has been accomplished through applied standards. Dean E. A. Holbrook of Pennsylvania State College will discuss the status of mining projects now before the American Engineering Standards Committee. Dr. A. F. Greaves-Walker, Dean of the State College of Engineering of North Carolina, will talk on the non-metallic industries of the south; and Dr. Henry Mace Payne will speak on the mineral development in the South.

The annual banquet will be held on Thursday evening at the Mayflower Hotel.

American Society of Mechanical Engineers Meets Dec. 6

The annual meeting of the American Society of Mechanical Engineers will be held Dec. 6 to 9 at the society's headquarters, 29 West 39th St., New York. The program covers a wide range of subjects, including smoke problems, fuels, heat transmission, central station power, oil and gas power, and machine-shop practice. The annual banquet will be Wednesday, Dec. 8.

Aluminum-Silicon Alloys Discussed

At a meeting of the London Local Section of the Institute of Metals held at the Royal School of Mines, South Kensington, on Nov. 4, A. G. C. Gwyer, chief metallurgist of The British Aluminum Co., Ltd., Warrington, gave a lecture on "The Structure and Properties of the Aluminum-Silicon Alloys." The lecture dealt with the constitution, structure, and mechanical properties of aluminum-silicon alloys, which have unusual properties. They are much lighter than pure aluminum, whereas the great majority of aluminum alloys in use at the present time are heavier, and in both the chill- and sand-cast states possess a much higher resistance to shock than many well-known alloys. They also possess excellent ductility, but on the other hand their elastic limit and resistance to fatigue are not quite so good as that of some of the other well-known light aluminum alloys. They are, however, distinguished by a high degree of incorrodibility, particularly when exposed to marine atmospheric conditions.

Empire Congress Delegates Will Visit Mines

George C. MacKenzie, secretary of the Canadian Institute of Mining and Metallurgy, on Nov. 17 addressed the Manitoba Chamber of Mines at Winnipeg, detailing the plans adopted for the reception of the delegates to the British Empire Mining and Metallurgical Congress to be held next August. The first session will be held in Montreal, after which a trip across the continent occupying about six weeks has been arranged for which will enable the delegates to visit many of the mining fields. After a two-day session in Toronto the delegates will visit the Niagara district, the Sudbury nickel field and the Cobalt and Porcupine camps. Another session will be held in Winnipeg, from which airplane trips will be taken to the Manitoba mining districts. In the course of their westward journey the lignite briquetting plant will be visited.

After a rest at Banff the party will then be taken to the Turner Valley oil fields, the Lethbridge coal mines, the Trail smelter, the Sullivan zinc and lead mine, and other places of interest. The final session will be held in Vancouver, after which it is planned to visit the Britannia mine, going on to Victoria and Prince Rupert. The return trip will be by way of the central collieries of Alberta and Sault Ste. Marie. The trip will end with a visit to the mining and metallurgical centers of the Maritime Provinces.

Mr. MacKenzie stated that the dominion and provincial governments had promised assistance, and he asked the co-operation of the Manitoba branch of the Canadian Institute of Mining and Metallurgy and the Chamber of Mines. Premier Bracken of Manitoba promised on behalf of the government that some aid would be forthcoming.

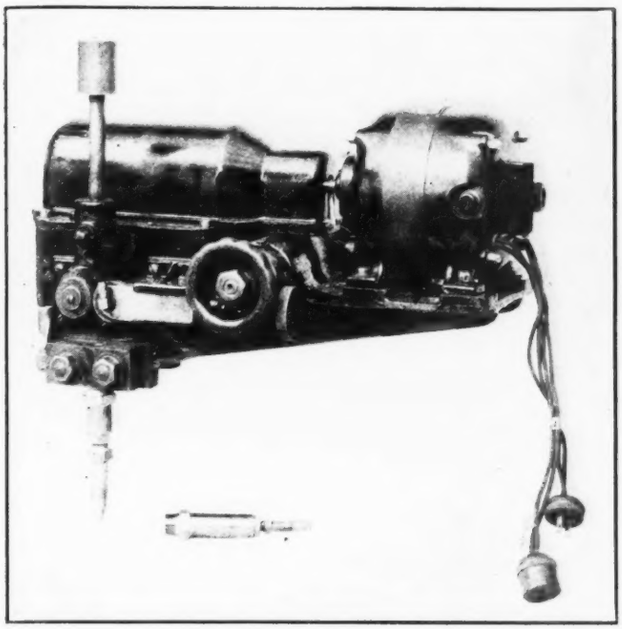
Power Show Program Ambitious

Educational exhibits and motion pictures will play an important part in the programs of the next "power show" in New York City. This, the fifth National Exposition of Power and Mechanical Engineering, will be held in the Grand Central Palace from Dec. 6 to 11. Over 800 exhibits of engineering apparatus are to be displayed. Of these about half will demonstrate the generation and use of heat and power. Welding apparatus will be shown in ten displays.

Among the educational exhibits will be one illustrating a simple method of laying out piping systems by isometric drawing. The motion pictures, nineteen in number, include: "The Story of Brass and Copper"; "The Story of Asbestos"; "The Story of Abrasives"; and "The Story of Power."

The management is making preparations to entertain the 90,000 visitors that are expected. Some of these will be in town to attend the meetings of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers which are to be held in New York during the week of the show. The managers are Fred W. Payne and Charles F. Roth.

New Machinery and Inventions



Constant arc length is maintained in this electric welder by controlling speed of feeding electrode wire to the weld

Welding Automatically With Electric Arc

Operation Smooth, Rapid and Accurate—Started by Push Button—Intended for Repetitive Work

A new design of automatic arc welder, which, it is claimed, welds with great smoothness, speed, and accuracy, has been introduced by the General Electric Co. With this equipment, the operator needs but to push a button to start the sequence of operations which produce the weld without further effort or skill on his part.

The new welder starts the arc by first touching the electrode to the work and then withdrawing it, thereafter maintaining a constant arc length by feeding the electrode wire to the weld at the exact rate of speed necessary to replace the electrode fused into the weld. It is claimed that the new equipment will perform these operations more rapidly and with a greater degree of accuracy than is possible by the most expert hand operators.

The automatic welding head incorporates the necessary mechanism for feeding the electrode to the arc, and consists essentially of a pair of feed rollers geared to a constant-speed motor through a magnetic clutch. The gearing and feed mechanism are contained in one housing, to which the motor is bolted.

Feed rollers feed the welding wire through the nozzle to the arc. The distance and pressure between these rollers is readily adjustable. Each welding head is equipped with a set of nozzles for $\frac{3}{32}$-in., $\frac{1}{8}$-in., $\frac{5}{32}$-in., $\frac{3}{16}$-in., and $\frac{1}{4}$-in. wire.

The speed of wire feed may be adjusted by means of a selective gear changer which permits the gear ratio to be altered at will to adapt the speed of the feed rollers to the size of wire and the welding current used. Three gear-speed changes can be made by moving the gear shift pin which extends from the rear of the gear housing. An additional finer adjustment can be made by means of a rheostat in the field of the motor.

Provision is made for pointing the electrode backward or forward in the line of weld, and also for moving it sideways. The pointing of the electrode is obtained by rotating the head on its horizontal shaft, and the lateral movement by means of the handwheel on the front of the head.

Control equipment consists of a control panel, a meter panel, and a push-button station. The control panel mounts the main line contactor for the welding circuit and two smaller contactors for interlocking the travel motor with the arc. By means of auxiliary contacts, the line contactor controls the starting and stopping of the feed motor. The magnetic clutch is operated forward or backward by a voltage relay, the coil of which is connected across the arc. Thus the electrode is fed to or from the work automatically, adjusting itself to any irregularities in the surface of the work. One rheostat controls the speed of the feed motor and the other controls the voltage setting of the arc.

The new automatic arc welder will be sold either separately (where the user constructs his own clamps) or as part of a complete welding equipment, including the necessary clamps and framework for holding the work. It will find its principal application in the construction of such standard products as pipe, tanks, boilers, cans, and automobile axle housings where the welding operation is constantly repeated as part of a regular production schedule.

Removes Dust Explosion Hazards by Vacuum

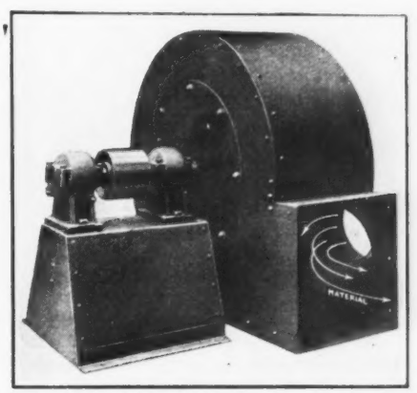
A powerful and rapid dirt-removal system that picks up, conveys and collects dust in one operation has been designed and placed in operation by the Allen and Billmyre Co., Inc., New York, N. Y. This system, electrically operated, is known as the "Tabco," and performs its work without spreading or raising any dust into the atmosphere.

In operation it is simple, for it acts similar to the ordinary household vacuum cleaner, differing only in that it is extremely powerful and has an enormous capacity. Multistage centrifugal blowers and exhausters are used in this device, and are made in a wide range of sizes and capacities for delivering air or gas at different pressures. They are built in units of ½ to 50 hp.

Because no dust is raised during its operations the manufacturers claim that this system is particularly adapted to use in coal pulverizing plants and other places where the accumulations of dust constitute a serious explosion hazard.

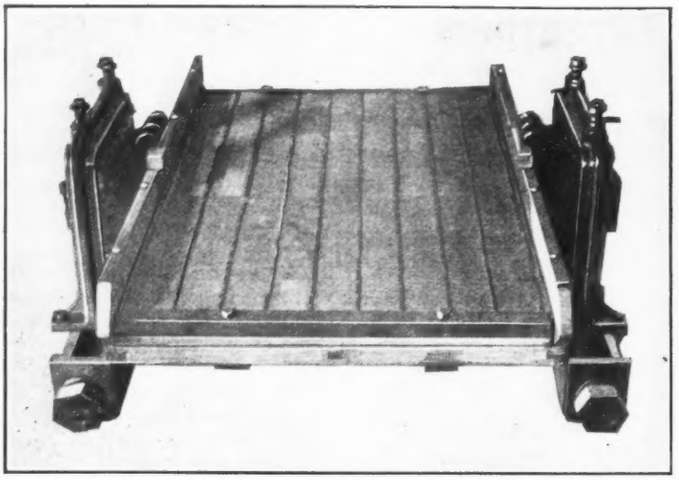
Long Life for This Fan

In the accompanying illustration is shown an exhaust fan that has a projected inlet adjacent to the discharge outlet, instead of a center inlet, as contained in ordinary fans. The material is immediately discharged without passing through the wheel or around the housing, the wheel therefore being in balance at all times, never becoming clogged. These fans, it is claimed, will handle every kind of material that can be conveyed by air. Suction is created by centrifugal pressure, the air being forced centrifugally to the side of the housing opposite the wheel, and the pressure of the air passing the projected inlet creates a high suction. Pressures up to 12 in. are obtainable.



Exhaust fan discharges immediately

The fans are adjustable and reversible. Each machine is adjustable to over thirty different combinations. The machines, which are known as the Everlasting exhaust fans, are constructed almost entirely of steel, including the housing, bearing standard and wheel. Ball-bearing pillow blocks used on the drive shaft. The MacLeod Co., Cincinnati, Ohio, is the manufacturer.



This vibrating screen is noiseless and has no moving parts

A Noiseless Vibrating Screen

An electrically operated vibrating screen has been devised by the Traylor Vibrator Co., of Denver, Colo., for screening wet or dry material. This screen, known as the "Supreme," has no bearings or moving parts and requires no oil or grease. The makers say that the absence of noise in its operation is noticeable, this being due to the elimination of striking or bumper blocks, absence of bearings or cams, and the direct use of electric power.

Uniform vibration is secured through the use of stators and armatures for mixed alternating and direct current, with armatures assembled on vibrator members. Inclosed shock absorbers do away with the vibration between the screen and superstructure or screen platform supports. The screen is of moderate weight, heavy construction being unnecessary owing to the aforesaid absence of moving parts. It is designed to operate on 110-, 220-, or 440-volt, 60-cycle, alternating current, together with a motor-generator set of small capacity. The screen is shown in the accompanying cut. It is also made in a laboratory size weighing only twenty pounds.

Meter Reads Volts or Amperes, Either A.C. or D.C.

With the increasing interest in the more efficient use of current both alternating and direct, the mine electrician is more and more coming to the use of testing instruments. The Martindale Electric Co., Cleveland, O., has announced a new combination ammeter and voltmeter that can be used for either alternating or direct current. This instrument is known as the Martindale universal portable ammeter and voltmeter.

It consists of a separate voltmeter and ammeter mounted together in the same case, in which space is also provided for five ammeter shunts, rated at 5, 10, 50, 100 and 300 amp. respectively. The voltmeter has an internal resistance of such value that the full scale may be 75, 150, 300 or 600 volts, depending upon which binding posts are used. This instrument is so constructed that either meter may be removed from the case and used separately.

Filtering Air in a New Way Eliminates Difficulties

A new air filter that is said to be revolutionary in design and to eliminate many difficulties heretofore found in air filters, has been announced by the American Blower Co., of Detroit, Mich. By means of this new filter, which is of dry plate design with hair-like tentacles for the arresting and retention of dust and dirt, dust-laden air is divided into a series of small jets, which strike the flat filament-coated surface of the plates; dust and soot are projected against the filament, seized, and retained. The air, changing its direction and rebounding from this surface, flows through to the next plate and is carried through ten successive dust-removal operations of this type. As dust builds up on these flat surfaces, each preceding layer acts as a retentive member, the dust itself being the principal dust - arresting and retaining factor for the ensuing particles of dust and dirt. In this way, the use of adhesives is avoided and the maximum load of a cleaner or filter is multiplied many times over what it would otherwise be.

The outstanding advantages of this type of air filter are said to be that it is impossible to clog the filter, that it does not require oil or other adhesives which have to be changed from time to time, that it has a constant effect and constant efficiency, and that dust builds upon dust and does not get in the line of air flow.

Self-Lubricating, Non-Metallic Gear Material Available

In its announcement of a new gear material the Fibroc Insulation Co., Valparaiso, Ind., states that gear teeth made from it have a life approximately 35 per cent greater than that of ordinary gear teeth.

This material is known as Fibroc GR and is a bakelite product which is impregnated with graphite. The manufacturer claims that it can be cut and formed into gears the same as other bakelite materials and has the quality of noiseless operation which is a characteristic feature of nearly all non-metallic gears.

New Relay Designed for Wide Range of Service

Superseding its old relays which were known as the Imperial type, the Roller-Smith Co., 233 Broadway, New York, announces a new line of direct-current relays, type SR.

On these new instruments the scales are longer and according to the manufacturer the accuracy is greater while the torque has been increased several times. The new 7½-in. round-pattern style of case has been adopted to match the company's type SA and type SD lines of indicating instruments.

These relays use the regular instrument mechanisms for operating the self-contained, circuit-opening or closing switch. The instrument has a platinum spring contact attached to its pointer, which contact co-operates with a similar one carried by an externally-adjusted pilot needle. This latter is set by means of a slotted-head button projecting from the front of the relay case. The circuit established on the engagement of the contacts energizes an electro magnet which operates the switch and effects external circuit change for which the relay is designed.

These relays are available in the following forms: Reverse current, overload, underload, closed circuit underload, overvoltage and undervoltage.

Catalogs

Storage Batteries—Bulletin GEA-484 of the General Electric Co., Schenectady, N. Y., describes its control equipment for charging storage batteries.

CO Meter—The Bacharach electric CO meter for carburetor adjustment of high-speed internal-combustion engines is covered in Bulletin 253 of the Bacharach Industrial Instrument Co., Pittsburgh.

Flotation Machine—Bulletin No. 1 of the General Engineering Co., Salt Lake City, Utah, covers the new MacIntosh pneumatic flotation machine.

Welding—Welding rods for electric welding are covered in a small bulletin of the Chicago Steel & Wire Co., Chicago, Ill. These rods are of green surfaced Weldite.

Wire Rope—The American Cable Co., New York, has issued a 108-page book that is a treatise on the selection, use, and care of wire rope for mine service.

Belt Drive—A folder issued by Harry M. Perry, 702 North Main St., Los Angeles, Calif., describing a device called the "Beltslacker," contains some new pulley horsepower data.

Valves—A small bulletin of the Homestead Valve Manufacturing Co., Homestead, Pa., discusses the use of Homestead valves. It is entitled "Valve Economy."

Wire Screen—The American Rheolaveur Corporation has just negotiated a contract with the British Wedge Wire Co., Ltd., of England, to handle the latter's products in the United States. The principal product of interest to the mining industry is wedge wire screen, which is advocated for dewatering. A catalog covering this material may be obtained from the American representative of the manufacturers.

Market and Financial News

Revenue Act Revision

Big Treasury Surplus Should Go to Reduce Debt or Corporation Taxes

By Robert M. Haig
Professor of Economics, Columbia School of Business

Once more the receipts from federal taxes have been grossly underestimated. A large surplus has accumulated in the Treasury. Once more the clamor arises from those who hope to share in the benefits of tax reduction.

In this country we are still in that primitive stage of budgetary development in which an overestimate of yield is considered a good fault, perhaps even a positive virtue. We have not yet reached that higher stage where our Gladstones are nearly as much embarrassed by overestimates as by underestimates and feel called upon to apologize for their surpluses.

The announcement of this surplus, which promises to amount to as much as $400,000,000, has precipitated a flood of suggestions as to how to dispose of it. President Coolidge originally urged a flat rebate on this year's income tax payments, but later seconded Secretary Mellon's suggestion of a credit on the tax payments due next March. The Chamber of Commerce of the United States recommends the reduction of the corporation tax and the elimination of the estate tax and the taxes on particular businesses. Representative Garner estimates that by giving the corporations a reduction of $200,000,000, prices to the consumers will be reduced as much as $600,000,000. Representative Hull says that the tariff should first be reduced. Senator Watson favors using the surplus to pay off debt.

The disposal of this surplus promises to be determined by a partisan and political scramble in which Senator Watson's conservative proposal will not receive the consideration its wisdom deserves. With more than nineteen billions of Liberty bonds outstanding and with the prospects for receiving large payments from our foreign debtors far from bright, there seems to be little occasion to seek far afield for a suitable use for $400,000,000.

But apparently somebody's taxes are going to be reduced, and when the discussion reaches this point, American industry and business should insist upon a hearing. The time has come when the country ought to be asked to make up its mind deliberately whether it desires and intends that taxes on business shall form a permanent part of the federal financial system.

The most acute situation is that relating to the income tax on corporations. Corporations now pay $13.50 on every $100 of profit. A stockholder, when he receives what is left of that $100 as a dividend ($86.50), may, at the most, take a credit of 5 per cent or $4.35. In other words a dollar of business profit, earned by a concern doing business under the corporate form and distributed as a dividend, must pay a special tax of something over 9 per cent. A dollar of business profit earned under the partnership or individual form of organization does not pay this 9 per cent. In other words we now have a heavy federal business tax and it is restricted to corporations.

It is true that the corporation possesses an advantage in that, until it chooses to distribute its profits, such profits do not become subject to surtaxes, whereas the profits of partnerships and individual businesses become subject to surtaxes as they are earned, not when they may be distributed. But can anyone seriously contend that this corporate privilege of retaining earnings in the business justifies a discriminating tax of over 9 per cent?

Until 1917 a corporation paid a rate no different from the normal rate on individual incomes. In that year a difference of 2 per cent appeared and both the excess profits tax and the capital stock tax came into existence. In 1918 the 2 per cent differential disappeared for one year, but the other taxes continued. The 2 per cent reappeared in 1919 and 1920. After the repeal of the excess profits tax the differential became 4½ per cent in 1922 and 6½ per cent in 1923. Upon the repeal of the capital stock tax this year, the difference became nominally 7½ per cent, a discrimination of over 9 per cent.

Thus it appears that the present corporation income tax is not merely a charge imposed for the privilege of holding profits in the business, free from surtaxes. It is largely a tax in lieu of the old war taxes on corporations. The excess profits tax and the capital stock tax were so vexatious in practice that the business corporations welcomed their repeal even at the cost of an increased differential under the income tax. But now the real questions emerge: Why should there be a special federal tax on business profits as distinguished from other types of income? If there should be such a business tax, why confine it to corporations? Should it not be as broad as business itself?

These questions are momentous ones for American business and they deserve careful consideration. England, faced with these questions, decided that she could not afford to impose a special business tax on corporate profits, in spite of her pressing need for revenue. The case against business taxation is a strong one. It does not need to rest for its validity upon the naïve assumption that the corporation tax is practically always shifted to the consumer, with large additions, and that the best way to help the consumer is to reduce the corporation rate. The case is by no means so simple as this. The Joint Committee on Internal Revenue Taxation, established by the Revenue Act of 1926, should be devoting itself to an analysis of this problem and the formulation of a wise policy.

Colonel Ayres Warns Against Artificial Stimulation of Business

Efforts in This Direction Would Bring Drastic Decline During 1927

After reviewing the recent cycle of "prudent" prosperity in the United States, Colonel Ayers, of the Cleveland Trust Co., sounds a note of warning for 1927. A slackening of industrial activity is certain, he thinks; the extent of it will be increased if unwise efforts are made to stimulate activity comparable with that of last spring. In the *Business Bulletin* he says:

"The first major factor which puts in jeopardy the prospects for uninterrupted continuation of this period of prosperity is the reduced purchasing power of the agricultural districts. The second is the gradual decline in the volume and value of new building construction. For five years past we have been experiencing in this country a great building boom which has now made good the shortages resulting from the nation-wide underconstruction of the war and post-war periods.

"It has added to our cities the new suburban developments made possible and desirable by the universal use of the automobile. This long-continued wave of exceptional activity in building has been one of the most important elements in sustaining national prosperity. It is now clearly waning steadily, although rather slowly, and unfortunately there is no present prospect of any considerable volume of new construction being undertaken in the rural sections of the country where shortages still exist.

"Despite excellent current reports for industrial output and transportation activity, and despite the clear prospects that the holiday trade of this year will be the best in our history, the evidence is beginning to accumulate showing that the causes making for less good business conditions are already operative. Industrial profit margins are rapidly narrowing. Earnings and profits of manufacturing will be greater in 1926 than ever before, but the statements now available covering the operations of the third quarter closely indicate that the exceptional industrial prosperity of the first and second quarter was by no means fully continued in the third quarter. Current reports indicate that still narrower profits will be realized by very many industrial firms in the fourth quarter. Automobile production is declining sharply, and employment in motor manufacturing centers is falling. The number of reported insolvencies sharply increased in October.

"The developments of the next few months will probably determine how far general business will slow down in 1927. The fundamentals are still exceptionally sound, and no such composite of bad conditions exists as was typical of the latter months of earlier

periods of sustained prosperity. There is no need now for any depression to enable business to recover from excesses committed during the time of prosperity. The one real danger is that business men may now indulge in unwise attempts to stimulate business back to the pitch of activity that it reached last spring.

The easiest way to do this, and the most dangerous one, would be to enter upon a new competition of easy terms in installment financing. The existing situation with regard to the financing of installment selling is probably adequately safe and reasonably sound even in a time of slowly declining general business. However, the Christmas trade is just ahead of us, and that could be increased materially by granting customers more generous terms for the purchase of luxury goods. A little later on the early spring buying of automobiles will begin, and the easiest way for the manufacturers to stimulate sales would be to enter upon a competition of reduced down payments and extended installment periods.

"Still later on spring building and real estate activity will get under way, and by granting purchasers and home builders easy enough conditions of payment a real wave of active business could be induced. By such devices business could be considerably stimulated, and the ultimate result would almost surely be a sharp and drastic decline before the end of 1927. If such a development should come it would be because we had invented new ways of doing foolish things after we had enjoyed for many months the blessings of prosperity.

"Such an outcome is most unlikely. The real prospects are that bankers and business men will carefully avoid the extension of credit for the financing of installment purchasing on easier terms than experience has shown to be safe. They have learned that the dangers of installment selling do not lie in any probability of defaulted payments among purchasers whose credit reliability has been investigated and who have bought on standard terms. The dangers are at the top, where the credit is granted, rather than among the ultimate consumers, where it is used. Competitions in ease of terms lead to disaster, and they are especially to be avoided under conditions such as now obtain when credit is so easy as to be tempting, business active, but slowing down, and employment general, but threatening to decline.

"The present prospects are that business will be somewhat slower in 1927 than it has been in 1926. Perhaps it is probable that the general business of the coming year will bear some such relation to that of this year as the business of 1924 had to that of 1923. If this should turn out to be the case the coming year would be one of somewhat smaller profits, decreased industrial production, rather smaller automobile output, and less building. There would be no wave of insolvencies, no serious unemployment, and no general reduction of dividends. There would be no real bear market for stocks. Before the end of the year a new upward movement would be under way. The coming year now promises to be about like that."

International Nickel during the third quarter of 1926 netted $1,314,432, compared with $1,408,116 in the preceding quarter. Dividends totaling $970,381 were paid, leaving a credit balance of $344,051. The corresponding figure for nine months was $1,177,979.

Imports and Exports of Ores and Metals in October, 1925 and 1926

Compiled from U. S. Department of Commerce Records

In pounds unless otherwise stated

Imports

	October, 1925	October, 1926
Antimony		
Ore { Gross weight	301,260	313,347
Ore { Antimony content	147,639	179,065
Liquated regulus or metal	2,508,692	2,537,814
Copper		
Ore	7,030,968	4,467,377
Concentrates	4,822,679	7,829,825
Regulus, coarse metal, cement copper	87,677	523,255
Imported from:		
Spain	248,600	1,129,439
Canada	3,697,515	3,772,414
Mexico	1,872,250	1,341,060
Cuba	4,106,446	2,734,729
Chile	1,829,486	3,231,767
Peru	110,273	247,487
Other countries	76,754	363,561
Unrefined black, blister and converter copper in pigs, bars and other forms	29,980,953	48,744,186
Imported from:		
Spain	.....	6,190,465
United Kingdom	.....	13,047,517
Canada	4,596,749	3,083,636
Mexico	8,551,896	8,272,034
Chile	2,540,528	3,027,432
Peru	7,944,967	10,414,048
Portuguese Africa	6,346,813	3,852,488
Other countries	.....	856,566
Refined copper	8,093,083	8,382,982
Old and clippings for remanufacture	1,264,945	656,559
Composition metal, copper chief value	.....	243,719
Brass		
Old and clippings for remanufacture	957,515	598,393
Lead		
Ore and matte	8,176,205	6,708,880
Bullion or base bullion	7,578,137	14,079,129
Pigs and bars	.....	694,072
Scrap lead, babbitt, solder, and other forms	143,213	329,488
Type metal and antimonial lead { Gross weight	55,953	2,194,049
Type metal and antimonial lead { Lead content	44,762	1,043,150
Manganese		
Ore, tons { Cuba, gross weight	128	2
Ore, tons { Other countries, manganese content	22,926	13,331
Pyrites, tons	7,700	31,956
Tin		
Ores, tons	14	11
Bars, blocks, and pigs	14,337,768	11,481,283
Imported from:		
United Kingdom	3,864,745	2,255,414
British Malaya	9,460,411	5,704,954
Dutch East Indies	.....	1,196,242
Hongkong	168,253	235,548
Australia	89,600	112,000
Other countries	754,259	1,977,125
Zinc		
Ore, zinc content { Free	.....	116,572
Ore, zinc content { Dutiable	7,738,635	3,405,494
Blocks, pigs and old	.....	7,665

Exports

	October, 1925	October, 1926
Copper		
Ores, concentrates, composition metal, and unrefined	72,214	500
Refined in ingots, bars, and other forms	55,370,977	67,555,863
Exported to:		
Belgium	5,707,872	3,904,034
France	10,000,000	12,048,762
Germany	12,240,108	15,974,194
Italy	4,562,397	7,614,313
Netherlands	3,297,611	5,586,920
Spain	45,063	.....
Sweden	1,596,731	2,365,538
United Kingdom	14,191,341	12,899,590
Other Europe	573,117	444,241
Canada	1,692,961	808,781
British India	.....	672,247
China	57,050	340
Japan	1,119,920	5,061,545
Other countries	286,806	176,072
Old and scrap	254,599	987,682
Pipes and tubes	234,354	293,652
Plates and sheets	432,959	351,240
Rods	4,322,946	2,891,340
Wire	1,127,752	1,045,319
Insulated copper wire and cable	1,205,806	1,465,684
Lead		
In pigs, bars, and other forms:		
From domestic ore	246,280	126,168
From foreign ore	9,751,576	11,662,611
Exported to:		
Belgium	336,040	112,047
France	560,083	504,121
Germany	2,256,671	3,696,744
Italy	.....	560,117
Netherlands	896,258	448,157
United Kingdom	4,649,243	2,688,889
Other Europe	224,172	840,212
Brazil	224,101	112,028
Other South America	344,885	121,178
Japan	448,052	2,577,048
Other countries	18,351	128,238
Other lead manufactures	1,351,172	2,573,548
Zinc		
Ore and concentrates, tons	12,363	4,795
Dross	5,757,190	2,164,409
Cast in slabs, blocks, or pigs	13,688,078	9,732,484
Exported to:		
Belgium	560,064	.....
France	616,148	840,122
Germany	769,726	112,002
Italy	1,075,455	336,136
Netherlands	257,557	96,912
United Kingdom	9,624,633	5,210,445
Other Europe	224,031	55,985
Argentina	56,008	1,994,637
British India	224,136	.....
Other countries	280,320	1,086,245
Sheets, strips, other forms	518,675	946,423
Dust	629,880	253,785
Other zinc manufactures	307,512	253,239

The Market Report

Metal Markets Extremely Dull

Sales of Copper and Zinc Disappointing at Lower Prices—Silver Also Down—Lead Quiet

New York, Dec. 1, 1926—The beginning of the last month of an extremely active year finds the non-ferrous metal markets in the doldrums. Not in months have the copper and zinc markets been so quiet as in the week ending today. The Thanksgiving Day holiday last Thursday is, of course, partly responsible, but the volume of buying has been disappointing even taking that into consideration. Prices of copper, zinc, and silver are all lower than a week ago. Lead prices have also weakened slightly in the New York market today, and the week's business has been smaller than usual. Tin holds its own, owing to a continued scarcity of supplies, and the minor metals are substantially unchanged.

The approach of inventory time is held as one reason for the light buying. General business conditions continue good, though not quite so active as for the last few months. Commodity prices in general seem on the downward trend again, and buyers are showing even less of a disposition than in the immediate past to buy for forward shipment.

Copper Nears 13½c.

Every seller of copper reports an extremely quiet week, and the total volume of business is the lowest in months. Prices have been shaded down further; on Monday, practically every seller was quoting 13⅝c. delivered in Connecticut and 13.70@13.75c. at higher freight rate points, with some sales reported as low as 13.575c., Connecticut, a price that was duplicated yesterday. Today the sole interest seemed to be in the Western Union order for 1,750 tons, a part of which was for delivery in December, for which there was keen competition. The business had not been booked up to the hour of going to press, but bids are known to have been made as low as 13.55c., delivered.

Foreign business has been excellent since the export association cut its price to 13.95c., c.i.f. Hamburg and Havre, yesterday. The former level was 14.125c. During the week the British Metals Corporation decided to carry on its business independently of Copper Exporters, Inc., but its action is not considered to be a serious blow.

Copper producers are far from bullish, but they feel that the recent decline is about at an end, for the time being anyway. They report many consumers ready to buy as soon as prices become stable, but they are not yet ready to assure them that this condition has arrived. Most of the sales have been made for December and January.

New York Lead Price Shaded

Though buying of lead in the domestic markets has been in only fair volume during the week ending today, the situation may be described as quiet rather than as weak. Prices have been remarkably steady at the same levels that have prevailed for several weeks: 8c. in New York and 7.80c. in St. Louis. The American Smelting & Refining Co. has maintained its official contract price at 8c., and no sales of consequence had been made at a figure either above or below this until late today when at least one good-sized order was placed at 7.90c.

The London market has declined the last two days, but there is still a narrow margin in favor of shipping Mexican bullion lead abroad. Should the

Average Metal Prices for November 1926

Copper:	
New York Electrolytic	13.576
London Standard Spot	57.293
London Electrolytic Spot	65.551
Lead:	
New York	8.005
St. Louis	7 800
London Spot	29.270
London Forward	29.563
Silver:	
New York	54.141
London	25.192
Sterling Exchange	484.359
Zinc:	
St. Louis	7.199
London Spot	33.491
London Forward	33.483
Tin:	
99 per cent	68.667
Straits	70.630
London	309.284
Quicksilver	99.000
Antimony	13.385
Platinum:	
Refined	112.000
Crude	105.250
Aluminum, 98 per cent	27.000

Daily Prices of Metals

Nov. Dec.	Copper N. Y. net refinery	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
25	Holiday	.....	.....	....	....	.....
26	13.425	69.75	71.875	8 00	7.80	7.15@7.20
27	13 45	69.75	72.00	8 00	7 80	7.15@7.20
29	13 40	70.25	72 50	8 00	7 80	7.125–7.175
30	13 375	69 50	71.625	8.00	7.80	7.10@7.125
1	13.325	69.50	71.25	7.90@8.00	7.80	7.10
Av.	13.395	69.750	71 850	7 990	7 800	7.143

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Nov. Dec.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
25	56¾	57½	65	313	302¼	29¼	29 9/16	33½	33⅝
26	56¾	57½	65	315½	303¼	29¼	29 9/16	33⅝	33⅝
29	56⅞	57⅝	64¾	320	303¼	29⅜	29 9/16	33 13/16	33¾
30	56½	57¼	64	317	300¾	29	29¼	33⅝	33 9/16
1	56⅝	57⅜	64	314½	299¼	28¾	29 3/16	33 3/16	33 7/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver		Gold London	Nov. Dec.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
25	Holiday	....	25⅛	84s11½d	29	4 84½	54⅜	25¼	84s11½d
26	4 84½	54½	25¼	84s11½d	30	4 84½	54⅛	25⅛	84s10½d
27	4 84½	54¾	25 7/16		1	4 84⅜	53¼	24 11/16	84s11½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

London price, however, sag below £28, a downward revision of the present price in New York would be given very serious consideration.

Large buyers seem to be more inclined to commit themselves at present prices than the smaller concerns. Manufacturers of plumbers' supplies, for instance, are hesitant about buying, though this may be a reflection of some slackening in building operations. Buying is confined mostly to prompt and December, with comparatively little for early months of the coming year. Taken as a whole, November sales of all producers were better than had been expected and with one or two exceptions they are in a comfortable position with respect to their December quotas.

The world's production was at a higher rate in October than ever before, according to the figures of the American Bureau of Metal Statistics. At the same time preliminary estimates indicate that the aggregate output in 1926 will be only 5 or 6 per cent higher than that of 1925. This figure compares with the rate of increase ranging between 11 and 12 per cent for the years 1923, 1924 and 1925. The average price for the year will be about ½c. less than in 1925, but the current price is about 1½c. below that of the corresponding period last year.

No Interest in Zinc

The volume of sales of zinc has been as small, comparatively, as that of copper, galvanizers taking no interest in the market except for an occasional lot for prompt or December shipment. All told, only 150 tons was reported as sold for January. However, more interest was taken in Brass Special than for some time, several hundred tons having been booked at about 10 points' premium over Prime Western grades. Sellers are not disposed to cut prices much to attract business, as they are well sold out of current production, and ore prices have not declined from the $47 level set a month ago. High-grade has been quiet at 9@9½c. delivered in the East. New York prices for Prime Western are at the customary premium of 35c. per 100 lb. above St. Louis.

Spot Tin Still Scarce

Spot Straits tin brought close to 73c. per lb. in New York on Monday, and prompt metal changed hands at 72.5c. Since then there has been some recession in sympathy with declines in London. Buyers are disinclined to more than meet their immediate needs and 5- and 10-ton lots for prompt shipment are the usual transactions to consumers. Normally the 25-ton lot is the usual unit. In spite of a backwardation of about 4½c. on February tin, there is little buying for future delivery. Tin of 99 per cent grade has not been active, but the quotations, to an extent nominal, are a little more than 2c. below those for Straits.

Silver Lower

A reflection of buying by India caused an advance in prices which culminated on Nov. 27 at 25 7/16d. in London and 54⅜c. New York. From this level rates dropped sharply to 24 11/16d. and 53¼c. on Dec. 1, the weakness being caused by sales on the part of India as well as China. At these lower quotations the market appears to have steadied, although the future is still uncertain.

Mexican dollars (old Mexican pesos) —Nov. 25th, holiday; 26th, 41½c.; 27th, 41⅜c.; 29th, 41⅜c.; 30th, 41½c.; Dec. 1, 40⅝c.

Exchange Is Higher

Though French francs and Italian lire reacted slightly on Tuesday, the principal foreign exchanges are higher than a week ago. Closing cable quotations on Tuesday, Nov. 30, were as follows: Francs 3.63c.; lire 4.23c.; and marks, 23.775c. Canadian dollars are at a premium of 7/64 per cent.

No Change in Zinc or Lead Ore Prices

Zinc Blende

High		$52.10
Premium blende, basis 60 per cent zinc	$48.00@	49.00
Prime Western, basis 60 per cent zinc		47.00
Fines and slimes, 60 per cent zinc	46.00@	44.00
Average settling price, all zinc		47.37

Galena

High	$104.90
Basis 80 per cent lead	100.00
Average settling price, all lead	103.13

Shipments for the week: Blende, 17,266; calamine, 52; lead, 1,738 tons. Value, all ores the week, $998,780.

Shipments for eleven months: Blende, 774,364; calamine, 1,333; lead, 116,357 tons. Value, all ores eleven months, $50,541,620.

Cessation of operations, some mines for one day and some for three days, over the Thanksgiving period, is estimated to have reduced the output this week about 3,000 tons. Purchases totaled approximately 16,000 tons, which will remove some 2,500 tons from the reserve stock, now limited to one week's supply ahead of the production.

Producers of lead are enlarging their reserve stocks, as the current price is unsatisfactory. About 13,000 tons have been accumulated.

Platteville, Wis., Nov. 27, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$49.75
Lead Ore	
Lead, basis 80 per cent lead	$101.00

Shipments for the week: Blende 1,028 tons; lead 40 tons. Shipments for the year: Blende, 51,558; lead, 1,766 tons. Shipments for the week to separating plants, 2,038 tons blende.

Steel Market Holds Up Well—Pig Iron and Coke Quiet

Pittsburgh, Nov. 30, 1926

Sales of steel products in November are commonly estimated to have run materially lighter than those of October, but mill operations do not reflect much change, there having been a drop of perhaps 5 per cent in the rate of steel production in the last thirty days. Steel makers are helped by heavy production of rails, partly for current laying, chiefly in the south, and partly in anticipation of next year's deliveries, there having been heavy buying in the last three months.

On the whole, less year-end decrease in activity is in evidence than would naturally be expected, and there is little time left for a decrease to affect the year's showing in production. Predictions are that general buying of steel will increase about the middle of December. For five consecutive years steel production has been heavier in January than in December.

The automobile industry is increasing its steel purchases somewhat, and has reinstated several important orders on which deliveries were suspended a few weeks ago. The decrease in automobile and truck production in the last two months has been much less than was being estimated in many trade circles.

Finished-steel prices are holding quite well, no disturbance having been created by slight irregularities developed recently in a few lines. Except for selling by a Cleveland mill, bars are rigid at 2.00c., Pittsburgh, as minimum. Sheets are not being shaded a great deal.

Pig Iron. — The Valley market remains practically stagnant. Some foundries will carry fourth-quarter contract tonnage over into the new year. Bessemer, $20; basic, $18.50; foundry, $19@$20, f.o.b. Valley furnaces.

Connellsville Coke — Both offerings and demand have been very light, prices declining only slightly with spot furnace at $4.25@$4.50 and spot foundry at $5@$5.50.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified. London prices are according to latest mail advices.

Aluminum—Per. lb., 98 and 99 per cent, 27c. Market quiet, with less buying for the first quarter of 1927 than was expected. London, 98 per cent, £107 per long ton for domestic purposes.

Antimony—Per lb., duty paid, spot: Chinese brands, 14¼@13⅜c.; January, 13⅜c. Cookson's "C" grade, spot, 17½c. Market quiet with little consuming demand in evidence.

Chinese needle, lump, 10c. Standard powdered needle, 200 mesh, 12c. White oxide, Chinese, 99 per cent Sb_2O_3, 14½c. Nominal.

Bismuth—Per lb., in ton lots, $2.70@$2.75. London, 10s.

Cadmium—Per lb., 60c. London, 1s. 10½d.@1s. 11d. for American metal; 1s. 10d. for Australian metal.

Cobalt—F.o.b. Canadian works, per lb., shot, 96@98 per cent, $2.50@$2.60. Black oxide, 70 per cent, $2.10. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray.

Germanium Oxide—Per gm. in 300- to 500-gm. lots, $5.

Iridium—Per oz., $120@$125 for 98@99 per cent sponge and powder. London, £32½ in iridio-platinum; £18@£22, nominal, for sponge and powder.

[1]**Lithium**—Per lb., 95@96 per cent grade in 1- to 5-lb. lots, $65.

Magnesium—Per lb., in ton lots, 8-lb. ingots (3x3x15 in.), 75c.; 3-lb. sticks (1⅝x33 in.) 80c.; 10-oz. sticks, (1x12 in.), 90c. Market firm. London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]**Molybdenum**—Per kg., 99 per cent, $25; C. P. metal, $80.

Monel Metal—Base price for shot, 32c. per pound.

Nickel—Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade). London, £170@£175 per long ton according to quantity. Demand continues excellent; production schedules unchanged.

Osmium—Per oz., $70@$80; London, £16@£19.

Palladium—Per oz., $68@$70. Pure metal as a constituent of crude platinum, $55@$60 per oz. London, £12@£13, though nominal prices are higher.

Platinum—Official price on refined metal $112 per oz. Open market cash sales of large lots at $107. Pure metal as a constituent of crude platinum, $106.

London, £23 per oz. for refined, and £20½ for crude and scrap.

Quicksilver—Per 75-lb. flask, $99@$99.50. San Francisco wires $98.67. London, firmer at £17. Market has been firm with the $99 price applying only to large lots. Some holders are asking $100 per flask. With the Spanish production in the hands of a syndicate, there seems little likelihood of any weakness in this metal.

Radium—$70 per mg. radium content.

Rhodium—Per oz., $65@$75; London, £10@£14. Nominal.

Ruthenium—Per oz., $50@$60, nominal. London, £8@£10.

Selenium—Black, powdered, amorphous, 99.5 per cent pure, $1.90@$2 per lb. in ton lots. London, 7s. 6d.@7s. 8d. Tire manufacturers are carrying on experiments with selenium to toughen rubber, but there is as yet no commercial demand from this source and supplies seem adequate.

Tellurium—Per lb., $2.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $10 per lb. in 25-lb. lots.

Tungsten Powder—Per lb., 97 to 98 per cent pure, $1.05.

[1]**Zirconium Metal**—Per lb., 98 per cent grade, $30 in 5- to 10-lb. lots.

Metallic Ores

Chrome Ore—Per net ton, f.o.b. eastern shipping points, $21@$24 for 45 to 50 per cent Cr_2O_3 ore. Prices firm and demand good.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports, established season prices:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

High-phosphorus foundry, over 0.18 per cent P, $4.15.

Eastern ores, cents per unit, delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 10¼@10¾c.

Spanish low-phosphorus, 52@54 per cent, 10@11c.

Algerian, low-phosphorus, 9¼@9¾c.

Spanish foundry or basic, 50@54 per cent, 8¾@9¼c.

Swedish foundry or basic, 66@68 per cent, 9@9½c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 32@34c. Caucasian (washed), 53@55 per cent, 38@40c. Market much firmer on contracts for 1927.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—Per lb. of MoS_2 for 85 per cent MoS_2 concentrates f.o.b. *Colorado*, 48@50c.

Tantalum Ore—Nominally, 75c. per lb. for ore containing 60 per cent Ta_2O_5 and 20 per cent Cb_2O_5.

Titanium Ore—Ilmenite, 52 per cent TiO_2, f.o.b. Atlantic seaboard, $12@$15 per gross ton. High-grade, imported, 55 per cent TiO_2, 1½c. per lb. Low-grade, domestic, 32 to 35 per cent, about $7@$8 per gross ton.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.50@$10.75; Western scheelite, $11@$11.25. European prices have advanced but the domestic market continues at the previous level. Russian and German steel works are reported to have entered the market.

Uranium Ore—Minimum 5 per cent U_3O_8 per pound of U_3O_8 contained, $5, f.o.b. Montrose, Colo.

Vanadium Ore—Containing 5 per cent V_2O_5, 25c. per lb. of V_2O_5, f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 55@60c. per pound V_2O_5, duty paid, seaboard. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, per ton:

Crude No. 1, $525; crude No. 2, $300; spinning fibers, $190; magnesia and compressed sheet fibers, $125@$150; shingle stock, $80; paper stock, $40@$45; cement stock, $25; short fibers, $10@$17.50; floats, $15. Active market for all spinning grades and shingle stock, but there is an overproduction of shorter grades. Mines are running at full capacity. The market seems fairly stabilized and prices are firm.

No. 1 Rhodesian crude, $325; No. 2, $250 per ton, c.i.f. New York.

Barytes—F.o.b. mines, per ton, bags extra:

Georgia: Barytes ore, crude, $7.50. Very good demand. Some competition with imported barytes even with the $4 per ton duty.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, 93 per cent $BaSO_4$, not to exceed 1 per cent iron, $8, f.o.b. mines. Market firm for first-grade ore.

Bauxite—No. 1 chemical ore, over 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 2 per cent Fe_2O_3, $8 per long ton, f.o.b. Georgia mines.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Borax—Carload lots, in bags, per lb.; crystals, 4½c.; granulated or powdered, 4c.; f.o.b. plant, *Pennsylvania*.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $27 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. New York, $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton; crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$20; ground, $7@$10.

Florida, pressed pottery, bulk, $13; ground, No. 1, $20; No. 2, $15. Sprayed mineral flour No. 1, $20; No. 2, $17.

1A grades, domestic, $16, f.o.b. *Delaware* plants. Good demand.

Imported English, f.o.b. American ports: Lumps, $13@$20; powdered, $45@$50.

Diatomite—Per short ton, f.o.b. plant: Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. Over 85 per cent silica, 98 per cent through 200 mesh, $14.50@$16 depending on quantity.

Emery—F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb. Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar—F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $6.50@$7.50 per long ton. Market good.

New Hampshire: Pottery grade, $8 per ton; soap grade, $8.50. Market heavy.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market good.

Tennessee: No. 1, pottery, 140 mesh, $16 per ton; 200 mesh, $18. No. 2, enamel, 140 mesh, $14; 200 mesh, $16. Demand good.

Maine: Pottery grade, ground, $19 per ton. Market good.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $18. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50 in bulk; $36.50 in bags or barrels. Acid lump, 98-1, $30 in car lots. Firm and quiet.

New Mexico: 85-5 gravel, $16.25; 85-5 lump, $16; 93-3 lump, $25; 96-3, ground 100 mesh, $35, bulk; $40 bags. Market strong.

Foreign spar, duty paid, $17@$17.50, tidewater.

Fuller's Earth—Per ton, f.o.b. *Florida:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh "up," $8; 200 mesh "up," $15. Market fair at unchanged prices.

Powdered, imported, duty paid, $24@$25 per ton.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Garnet — Domestic, per ton f.o.b. mines, $85. Market easy.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Jet asphaltum, $36; selects, $33; seconds (mine run), $25.50.

Graphite—F.o.b. *New York*, per lb.: Ceylon lump, 7½@8½c.; chip, 6½@7½c.; dust, 3@6c.; Madagascar flake, 6½@7c. Market quiet.

High-grade, finely ground, 12c. up; medium grade, 8c. up. No. 1 flake, 11c. up; fine flake, 9c. up. Foundry facings 4c. up. Amorphous, fine ground, 4c. up; fine ground crystalline, 7@12c.; amorphous fine ground graphite, 4@8c. Crude amorphous graphite, $15@$35 per ton according to grade. Market rather quiet and competition is keen. A great deal of graphite is being sold at less than cost to produce, it is reported.

Greensand—Per ton, f.o.b. cars, *New Jersey:* screened and bagged, best grade in carload lots, $30. Fair demand.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$8; agricultural, $6@$12; calcined, $7@$10.

Iron Oxide (See Ocher)—Standard Spanish red, 2½@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite**—20@$30 per ton for ordinary grades. Nominal.

Limestone — F.o.b. shipping points, depending on location: either lump or crushed, 75c.@$2 per ton.

Agricultural, 75c. up to $4 or $5 for crushed or pulverized. Prices depend upon source, purity, and fineness.

Magnesite—Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $40; grade B, $38; dead burned, $33; crude, $14. F.o.b. eastern seaboard, calcined, $40. Market fair.

Mica—F.o.b. plant, per ton:

New Hampshire: Mine run, $380, clean shop scrap, $25; mine scrap, $22. White dry ground, 20 mesh, $30; 40 mesh, $40; 60 mesh, $55; 100 mesh, $70; 200 mesh, $85. Some improvement noted in sales.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: special grade, $3.25; No. A 1, $2.75@$3; No. 1, $2.50; No. 2, $2.25@$2.50; No. 3, $1.25; No. 4, 65@70c.; No. 5, 40@45c. Grades depend on size of sheets. Good demand for Nos. 2 and 4.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher—F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $25@$28; second grade, 99 per cent through 225 mesh, $19. Market good.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent. $6; 70 per cent, $4.50; 68 per cent, $4.10; 66 per cent $4. Firm.

Florida, pebble domestic: 76@77 per cent, $6; 75 per cent, $5.25; 74@75 per cent. $5; 72 per cent, $4; 70 per cent, $3.50. Market dull.

Tennessee, ground, 95 per cent through 100 mesh, basis 65 per cent B.P.L. (tri-calcium phosphate), $8 per short ton, with unit differential of 20c. per ton. Ground rock season is about over until next spring. Rock going to acid manufacturers is being quite actively shipped on regular contract withdrawals. Contract prices, $5.50 for 75 per cent basis; $4.50 for 72 per cent basis.

Potash—New price schedule showing advances of 10c. to 45c. per ton over 1926 schedule went into effect on Dec. 1. Deliveries still being made, however, on old contracts. The new contract prices are as follows:

	Bags	Bulk
Muriate of potash 80 @ 85 per cent, basis 80 per cent....	36.00	34.60
Sulphate of potash 90@95 per cent, basis 90 per cent....	46.85	45.45
Sulphate of potash-magnesia 48@53 per cent, basis 48 per cent	27.00	25.60
Manure salt 30 per cent....	21.55	18.55
Manure salt 20 per cent....	15.30	12.30
Kainit 14@16 per cent.....	12.40	9.40
Kainit 12.4 per cent.....	11.90	8.90

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons.

Pumice Stone—In barrels, per lb., powdered, 2½@4c.; selected lumps, 5@7c.; lumps in bags, 3@5c.

Pyrites—Tharsis, per long ton unit of sulphur, c.i.f. U. S. ports; guaranteed 48 per cent sulphur, furnace size, 2½-in. diameter, 13¾c. Cinder from ore to remain property of buyers. Market looking up a little.

[1]**Quartz Rock Crystals**—Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Silica—Water ground and floated, per ton in bags f.o.b. Illinois: 400 mesh, $31; 350 mesh, $26; 250 mesh, $18. Glass sand, f.o.b. producing plant, 75c.@$5 per ton; molding sand, 65c.@$3.50; blast sand, $1.35@$3.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic, f.o.b. *Texas* mines; $24 for export, f.a.s. Atlantic ports. Good shipment against contracts. Open prices $1 higher than above. Prices unchanged.

Talc—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $10.50@$11; 96 per cent through 200 mesh, medium white, $9@$10; packed in 50-lb. paper bags. Demand better.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $10@$12; market good.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri:* Once ground through 40 mesh: rose and cream colored, $14. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh: rose and cream, $25; mill run, $15. Usual good fall business.

[1]**Zircon**—Freight allowed east of Mississippi River; 95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Mineral Products

Arsenious Oxide (white arsenic)—3½c. per lb. London, £16 per long ton.

Calcium Molybdate—$1.20 per lb. of contained Mo, delivered.

Copper Sulphate—4.80@5c. per lb. for either large or small crystals.

Sodium Nitrate—Crude, per 100 lb. ex vessel, Atlantic ports, $2.60@$2.65.

Sodium Sulphate (Salt Cake)—Per ton, bulk, f.o.b. works, $20@$22.

Zinc Oxide—Per lb. in bags, in car lots: Lead-free, 6¾c.; 10, 20 or 35 per cent leaded grades, 6⅝c.; French red seal, 9½c.

Ferro-Alloys

[1]**Ferrocerium**—Per lb., $5.50.

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4 to 6 per cent carbon, 11½c. Market active.

Ferromanganese—Domestic and foreign, 78@82 per cent, $100 per gross ton furnace, for prompt and first-quarter delivery. Old 1926 contracts at $88. Spiegeleisen, 19@21 per cent, advanced to $40 on carload business, f.o.b. furnace; 16@19 per cent, nominal at $39.

Ferrophosphorus—Electrolytic, 18 per cent P, $91 per ton; 24 per cent, $122.50; f.o.b. *Alabama* and *Tennessee*.

Ferrosilicon—Per gross ton, f.o.b. works, freight allowed on carload lots east of Mississippi River: 50 per cent, $87.50 for spot, $85 on contract. 75 per cent, $150 for spot, $145 on contract. 14@16 per cent, $45. Buying in progress for first quarter with sellers in accord on price.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—$1.02@$1.05 per lb. of W contained, f.o.b. works.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium—Per lb. of V contained, f.o.b. works, $3.25@$4, depending on grade.

Metal Products

Rolled Copper — Sheet, 22¼c.; wire, 15¾@16c. per lb., f.o.b. mill.

Lead Sheets—Full rolled, 11¾c. per lb.; clipped, 12c.

Nickel Silver—29¼c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 19⅝c. per lb.; rods, 16⅝c. per lb.

Zinc Sheets—11¾c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45 per net ton, f.o.b. shipping point.

Fireclay Brick—First quality, $40@$43 per M., Ohio, Kentucky, Central Pennsylvania; second quality, $35@$40.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—$40 per M., Pennsylvania and Ohio; $50@$52 Alabama and Illinois.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 2½c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London		Sterling Exchange	
	1925	1926	1925	1926	1925	1926
January	68.447	67.795	32.197	31.322	477.702	485.295
February	68.472	66.773	32.245	30.797	476.886	485.852
March	67.808	65.880	31.935	30.299	477.279	485.606
April	66.899	64.409	31.372	29.682	479.034	485.702
May	67.580	65.075	31.276	30.125	484.960	485.485
June	69.106	65.481	31.863	30.248	485.553	486.000
July	69.442	64.793	31.954	29.861	485.514	485.755
August	70.240	62.380	32.268	28.773	485.264	485.293
September	71.570	60.580	32.983	27.994	484.270	484.845
October	71.106	54.505	32.972	25.291	483.909	484.475
November	69.223	54.141	32.155	25.192	484.201	484.359
December	68.889	.....	31.835	.....	484.538	.....
Year	69.065	.....	32.088	.....	482.426	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1925	1926	1925	1926	1925	1926
January	14.709	13.822	66.065	59.013	70.607	65.325
February	14.463	13.999	64.714	59.669	69.525	66.375
March	14.004	13.859	62.892	58.603	67.739	65.489
April	13.252	13.706	60.575	57.200	64.194	64.690
May	13.347	13.599	60.131	56.494	63.560	64.313
June	13.399	13.656	59.899	56.778	63.369	64.591
July	13.946	13.924	61.467	57.864	65.750	65.625
August	14.490	14.174	61.613	58.857	68.169	66.857
September	14.376	14.062	61.886	58.705	67.693	66.528
October	14.300	13.862	61.977	58.304	67.523	66.298
November	14.353	13.576	61.280	57.293	67.893	65.551
December	13.866	.....	59.540	.....	65.625	.....
Year	14.042	.....	61.920	.....	66.804	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London		
	1925	1926	1925	1926	1925	1926	3 M
January	10.169	9.255	9.953	9.102	41.443	34.778	34.584
February	9.428	9.154	9.126	8.991	37.944	33.903	33.903
March	8.914	8.386	8.578	8.165	36.804	31.625	31.921
April	8.005	7.971	7.662	7.764	32.791	28.775	29.284
May	7.985	7.751	7.780	7.538	32.283	28.253	28.731
June	8.321	8.033	8.024	7.876	33.479	29.986	30.142
July	8.151	8.499	8.054	8.383	34.698	31.716	31.545
August	9.192	8.908	9.284	8.722	38.188	32.756	32.345
September	9.508	8.786	9.303	8.515	38.884	32.085	31.790
October	9.513	8.402	9.299	8.130	39.017	30.821	30.702
November	9.739	8.005	9.578	7.800	36.872	29.270	29.563
December	9.310	.....	9.157	.....	34.739	.....	.....
Year	9.020	.....	8.817	.....	36.429	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	99%		Straits			
	1925	1926	1925	1926	1925	1926
January	57.692	61.415	58.250	2.275	265.560	282.038
February	56.517	62.653	57.068	63.705	262.181	287.107
March	53.038	63.472	53.733	64.505	245.682	292.288
April	51.380	61.962	52.135	63.380	237.006	281.388
May	53.675	60.165	54.620	62.305	245.476	270.125
June	54.885	58.409	55.957	60.611	252.476	68.352
July	56.683	61.365	58.014	63.091	258.435	282.102
August	56.649	63.875	58.190	65.260	258.538	293.690
September	56.405	66.535	58.247	68.895	259.182	306.273
October	60.462	68.225	62.274	70.245	277.722	312.548
November	62.136	68.667	63.304	70.630	284.506	309.284
December	61.952	.....	62.928	.....	284.920	.....
Year	56.790	.....	57.893	.....	260.974	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London		
	1925	1926	1925 Spot	1926	1926 3 M
January	7.738	8.304	37.917	38.059	37.363
February	7.480	7.759	36.528	36.053	35.956
March	7.319	7.332	35.741	34.650	34.247
April	6.985	7.001	34.644	32.503	32.853
May	6.951	6.821	34.223	32.038	32.413
June	6.990	7.112	34.149	33.244	33.398
July	7.206	7.419	34.894	34.045	34.270
August	7.576	7.376	36.691	34.173	34.524
September	7.753	7.413	37.435	34.389	34.415
October	8.282	7.296	39.884	34.256	34.145
November	8.614	7.199	39.039	33.491	33.483
December	8.565	.....	38.327	.....	.....
Year	7.622	.....	36.624	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)	Quicksilver (b)	Platinum (c)	
	New York	New York	Refined New York	Crude New York
	1925	1926	1925	1926	1925	1926	1926
January	17.428	23.490	81.596	87.960	117.000	118.200	113.200
February	19.795	21.676	79.386	87.580	117.000	113.909	108.341
March	15.553	19.708	80.481	88.194	117.000	112.000	106.273
April	12.553	17.462	82.327	89.769	118.269	111.538	103.731
May	15.770	12.170	81.360	91.365	119.850	108.960	102.911
June	16.500	11.106	83.154	91.346	120.000	111.000	106.615
July	17.779	14.490	83.077	90.163	120.000	114.692	109.000
August	17.683	15.957	82.317	89.260	120.000	116.000	108.692
September	17.143	15.325	81.730	91.425	120.000	116.840	108.600
October	18.029	13.943	83.856	97.260	120.000	112.240	106.000
November	20.000	13.385	88.250	99.000	120.000	112.000	105.250
December	21.692	.....	90.000	.....	120.000	.....	.....
Year	17.494	.....	83.128	.....	119.093	.....	.....

(a) Antimony quotations in cents per pound for ordinary brands. (b) Quicksilver in dollars per flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1925	1926	1925	1926	1925	1926
January	24.66	22.76	23.76	21.76	23.76	22.26
February	24.50	22.76	23.26	21.76	23.76	22.26
March	24.06	22.76	23.06	21.76	22.91	22.26
April	22.89	21.38	21.76	20.66	22.26	21.05
May	21.57	21.12	20.26	19.76	21.16	20.76
June	20.76	20.76	19.76	19.76	20.11	19.80
July	20.76	20.44	19.76	19.26	20.26	19.49
August	20.76	19.87	19.76	19.18	20.26	19.26
September	21.04	20.11	20.03	19.26	20.50	19.33
October	21.50	20.76	20.37	19.76	20.83	19.97
November	22.64	.....	21.58	.....	22.08	.....
December	22.76	.....	21.76	.....	22.26	.....
Year	22.33	.....	21.26	.....	21.68	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1926					
	May	June	July	August	Sept.	Oct.
Alaska shipments	1,797	4,059	2,838	3,093	2,078	.....
Butte & Superior	.....	892†	.....	.....	†835	.....
Calumet & Arizona	2,454	2,104	1,666	1,960	1,793	2,331
Magma	1,228	1,208	1,345	1,315	1,211	1,198
Miami	2,298	2,241	2,200	2,447	2,251	2,468
New Cornelia	2,723	3,543	3,466	3,194	3,292	3,556
Nevada Con.	.....	27,539†	.....	.....	†29,090	.....
Old Dominion	1,173	1,058	985	1,350	797	938
Phelps Dodge	7,566	6,786	6,775	6,723	5,866	5,493
United Verde Extension	1,997	1,908	1,738	1,765	1,756	1,901
Utah Copper	.....	26,890†	.....	.....	†30,902	.....
Tennessee Copper	555	521	543	511	499	523

Foreign

Boleo, Mexico	935	1,008	1,106	1,124	898	992
Furukawa, Japan	1,513	1,323	1,526	1,550	.....	.....
Granby Cons., Canada	1,700	1,390	1,777	1,805	1,506	1,623
Union Minière, Africa	7,547	7,294	7,716	8,188	7,623	6,525
Mount Lyell, Aust.	.....	1,695†	.....	.....	†2,182	.....
Sumitomo, Japan	1,219	1,364	1,498	1,396	826	.....
Bwana M'Kubwa	.....	.....	.....	.....	195	255

†Three months.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1924		1925		1926	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	66,631	2,149	74,789	2,412	71,026	2,291
February	65,681	2,265	68,967	2,463	68,131	2,433
March	65,181	2,102	74,901	2,416	75,728	2,443
April	66,073	2,202	70,667	2,356	73,454	2,448
May	65,608	2,116	70,574	2,276	73,542	2,372
June	63,933	2,131	59,894	2,330	71,317	2,377
July	64,787	2,090	68,507	2,210	72,228	2,333
August	66,756	2,153	68,090	2,196	72,014	2,323
September	63,800	2,127	67,720	2,272	71,726	2,391
October	68,989	2,225	71,042	2,292	75,643	2,440
November	68,291	2,276	67,400	2,247	.....	.....
December	67,647	2,182	69,566	2,244	.....	.....
Total	793,377	.....	842,117	.....	724,809	.....
Monthly average	66,115	.....	70,176	.....	72,481	.....
Average of daily rate	.....	2,168	.....	2,307	.....	2,38

Mining Stocks—Week Ended November 27, 1926

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	48⅜	47⅛	47⅛	Oc.16, No.22 Q	0.75
Arcadian Consol.	Boston	*90	*90	*90		
Ariz. Com'l	Boston	10⅛	10	10⅛	Jy. 16, Jy. 30	0.50
Calaveras	N. Y. Curb	....	....	1⅛		
Calumet & Arizona	New York	70	68⅞	68⅞	De. 3, De. 20Q	1.50
Calumet & Hecla	Boston	17	16⅛	16⅞	No.30, De.15	0.50
Cerro de Pasco	New York	63⅛	62⅛	63	Oc. 14,No.1, Q	1.00
Chile Copper	New York	32⅛	32⅛	32⅜	De.1,De.27, Q	0.62½
Chino	New York	....	....	25½		
Con. Coppermines	N. Y. Curb	3	2⅞	3		
Copper Range	Boston	14⅞	14⅛	14⅞	May, 1925	1.00
Crystal Copper	Boston Curb	*40	*34	*37		
East Butte	Boston	2⅛	2⅛	2⅜	Dec., 1919	0.50
First National	Boston Curb	....	....	*14	Feb., 1919	0.15
Franklin	Boston	*30	*30	*30		
Granby Consol.	New York	36⅞	33⅛	35⅛	May, 1919	1.25
Greene-Cananea	New York	27⅛	23⅛	25⅜	Nov., 1920	0.50
Hancock	Boston	....	....	*59		
Howe Sound	New York	41⅛	39⅛	39⅞	Oc.1, Oc.15 Q	1.00
Inspiration Consl.	New York	27⅛	26⅛	26⅛	De.16, Ja.3, Q	0.50
Iron Cap	Boston Curb	3⅛	3	3		
Isle Royale	Boston	12	12	12	No. 30, De. 15	0.50
Jerome Verde Dev	N. Y. Curb	....	....	48		
Kennecott	New York	63⅛	62⅛	62⅞	De.3, Ja.2 Q	1.25
Lake Copper	Boston	....	....	*85	June, 1925	0.50
Magma Copper	New York	37	36⅛	36⅛	Oc.1,Oc..15,Q	0.75
Mason Valley	N. Y. Curb	2⅛	2	2		
Mass Consolidated	Boston	....	....	*20	Nov., 1917	1.00
Miami Copper	New York	16⅞	16⅛	16⅛	No.1, No. 15 Q	0.37½
Mohawk	Boston	42⅛	42	42	Oc.30, De.1 Q	2.00
Mother Lode Coa	New York	5⅛	4⅛	4⅞	Jn. 15, Jn. 30	0.37½
Nevada Consol	New York	16	15⅝	15⅝	Se. 17, Se. 30Q	0.25
New Cornelia	Boston	22⅛	22⅛	22⅛	No.5, No.22 Q	0.50
Noranda	N. Y. Curb	21	19	20		
North Butte	Boston	2⅜	2⅛	2⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	....	....	*39	Se. 1, Se. 15	0.05
Old Dominion	Boston	16⅛	16⅛	16⅛	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†137	†134	...	Se.25, Oc.2 Q	1.50
Quincy	Boston	18⅞	18	18	Mar., 1920	1.00
Ray Consolidated	New York	16⅛	16⅛	16⅛	Ap.20, Ap.30	0.25
Ray Hercules	N. Y. Curb	....	....	11⅛		
St. Mary's Min. Ld.	Boston	27	26⅛	27	Ap.17, My.18	2.00
Seneca Copper	New York	4	3⅞	3⅞		
Shannon	Boston	*31	*31	*31	Nov., 1917	0.25
Shattuck-Denn	Boston Curb	6⅛	6	6		
Superior & Boston	Boston	....	....	*30		
Tenn. C. & C.	New York	11⅛	11⅛	11⅛	No.30, De.15, Q	0.25
United Verde Ex	N. Y. Curb	24⅛	24⅛	24⅛	Oc.16, No. 1, Q	0.75
Utah Copper	New York	113	113	113	Se.3, Se.17 Q	1.75
Utah Metal & T	Boston	1⅜	1⅛	1⅛	Dec., 1917	0.30
Victoria	Boston	....	....	*65		
Walker Mining	Salt Lake	*73	*69	*73		
NICKEL-COPPER						
Internat. Nickel	New York	37¼	36⅜	37	Se.7, Se.30, Q	0.50
Internat. Nickel, pfd.	New York	103	103	103	Oc. 14, No.1,	1.50
LEAD						
Gladstone Mtn	Spokane	*30	*29½	*30	Nov., 1926	0.005
National Lead	New York	155	150	155	De.10, De 31 Q	2.00
National Lead pfd	New York	117⅜	116¼	117⅛	No.19,De.15 Q	1.75
St. Joseph Lead	New York	40⅜	39⅛	40⅜	Sept., 1926 QX	0.75
ZINC						
Am. Z. L. & S	New York	8	8	8	May., 1917	1.00
Am. Z. L. & S, pfd	New York	43½	42½	43⅜	Nov., 1920	1.50
Butte C. & Z	New York	5	4⅜	4⅜	De.10, De.24	0.50
Butte & Superior	New York	12⅛	12	12⅛	Se.15, Se.30 Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Eagle-Picher	Cincinnati	28⅛	27	28⅛	Au.14,Se.1 Q	0.40
Eagle-Picher, pfd	Cincinnati	....	....	100	Se. 30, Oc. 5 Q	1.50
New Jersey Zn	N. Y. Curb	....	....	191	No.20, De.10 X	2.00
United Zinc	N. Y. Curb	....	....	*70		
Yellow Pine	Los Angeles	*16½	*16	*16	Dec. 1925	Q 0.04
GOLD						
Alaska Juneau	New York	....	....	1½		
Argonaut	Toronto	*57	*52¼	*56		
Barry-Hollinger	Toronto	*90	*85	*87		
Carson Hill	Boston	....	....	*25		
Consol. W. Dome L.	Toronto	*22	21⅛	*21⅜		
Cresson Consol. G	N. Y. Curb	2⅛	2⅛	2⅛	Oct, 1926	0.10
Crown Reserve	Toronto	*10½	*9⅜	*9⅜	Jan., 1917	0.05
Dome Mines	New York	11	10	10⅛	Se.20,Oc.30,Q	0.50
Golden Center	N. Y. Curb	1⅜	1⅜	1⅜		
Golden Cycle	Colo Spring	....	....	2	No.30, De.10 Q	0.04
Hollinger Consol	Toronto	19.60	18.70	18.85	No.16, De.2 F	0.10
Homestake Mining	New York	62⅜	62	62	No.20,No.26 M	0.50
Kirkland Lake	Toronto	*79½	*70	*79		
Lake Shore	Toronto	14.50	14.15	14 40	De 2,De.15 X	0.20
McIntyre-Porcupine	New York	24	24	24	No.1, De.1 Q	0.25
Newray	Toronto	....	....	*39		
Night Hawk Pen	Toronto	*4	*3½	*4		
Portland	N. Y. Curb	....	....	*43		
Rand Mines	New York	....	....	41⅜	Au.23–30Am.Sh.	1.52
Teck-Hughes	Toronto	4.94	4.77	4.80	Jy. 15, Au. 2	0.05
Tom Reed	Los Angeles	*35	*35	*35	March, 1926	0.02
Tough-Oakes	Toronto	*64½	*57	*60		
United Eastern	N. Y. Curb	....	....	*45	July, 1924	0.05
Vipond Cons	Toronto	1.63	1.55	1.55		
Wright-Hargreaves	Toronto	8.50	8.15	8.30	Se.15, Oc.1 QX	0.07½
Yukon-Alaska Trust	N. Y. Curb	....	....	20		
GOLD AND SILVER						
Carnegie Metals	Boston	....	....	12		
Con. Cortez	N. Y. Curb	....	....	*4		
Con. Virginia	San Francisco	*6½	*5½	*5½		
Continental Mines	N. Y. Curb	....	....	*48		
Dolores Esperanza	N. Y. Curb	*73	*50	*70	July, 1923	0.05
Premier Gold	N. Y. Curb	1⅞	1⅞	1⅞	Se.15, Oc.4 Q	0.08
Tonopah Belmont	N. Y. Curb	2⅜	2⅛	2⅛	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	....	....	*25	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	3⅛	3⅛	3⅛	Se.30, Oc.27 SA	0.07½
Unity Gold	N. Y. Curb	....	....	*30		
West End Consol	N. Y. Curb	....	....	*9	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*40	*40	*40	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	N. Y. Curb	....	....	1	Oct., 1920	0.50
Beaver Consol	Toronto	*63⅜	*55	*62	May. 1920	0.03
Castle-Trethewey	Toronto	1.18	1.12	1.12		
Coniagas	Toronto	4.50	4.30	4.50	May, 1924	0.12½
Keeley	Toronto	1.62	1.55	1.55	Se. 1, Se.15 SA	0.12
Kerr Lake	N. Y. Curb	*85	*78	*78	Oc.1, Oc.15 SA	0.12½
La Rose	Toronto	*5½	*5	*5½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	....	....	*13	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav	Toronto	1.13	1.13	1.13	Oct., 1920	0.03
Mining Corp. Can	Toronto	2.76	2.74	2.76	Jy.1, Jy.15 SA	0.12½
Nipissing	N. Y. Curb	5⅜	5⅛	5⅜	Se.30, Oc.20 Q	0.15
Temiskaming	Toronto	*9⅜	*9⅜	*9⅜	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	5⅛	4⅞	5	Se.28,Oc.1, QX	0.25
Alta Merger	Salt Lake	†*4	†*2	....		
Bingham Mines	Boston	34⅛	32⅛	32⅛	Se.20,Se.30 Q	1.00
Cardiff M. & M	Salt Lake	....	....	*22	Nov., 1924	0.10
Chief Consol	Salt Lake	2.80	2.80	2.80	Oc.10, No.1 Q	0.10
Consti'n Mng.&Mill'g	Spokane	*55½	*50	*51		
Emma Silver	Salt Lake	†1	†*75	....		
Erupcion	Boston Curb	1 7/16	1 7/16	1 7/16	Se.25, Oc.1, QX	0.10
Federal M. & S	New York	80½	80	80		
Federal M. & S., pfd.	New York	73⅜	70½	70½	No.24, De.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*8	*6	*8		
Hecla Mining	N. Y. Curb	16⅛	16⅛	16⅜	No.15,De.15 Q	0.50
Highland-Surprise	Spokane	*23	*22	*22⅜		
Iron King Mining	Salt Lake	....	....	*19		
Keystone Mining	Salt Lake	*25	*25	*25	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*15	*14½	*14¾		
Lucky Tiger-Com	Kansas City	†7.65	†7.40	...	Nov. 20, 1926	0.07
Mammoth Mining	Salt Lake	2.70	2.70	2.70	Mar.24,Apr. 1	0.10
Marsh Mines	Spokane	2⅜	2⅛	2⅛	Se.15, Oc.19	0.15
Park Utah	New York	6.40	6.40	6.40	Se.15, Oc.1 Q	0.15
Plutus Mining	Salt Lake	1.85	1.85	1.85	Oct. 15, Q	0.15
Prince Cons	Salt Lake	2⅛	2⅛	2⅛		
Silver King Coal	Salt Lake	8.45	8.25	8.45	Se. 20, Oc.1, Q	0.25
Silversmith	Spokane	*30	*28½	*30	Oc.1, Oc.10 Q	0.02
Strattons Mines	Spokane	*50	*35	*35		
Sunshine M. Co	Spokane	*38	*36	*38		
Tamarack-Custer	Spokane	*54½	*47½	*47½	Sept., 1924	0.25
Tintic Standard	Salt Lake	11.75	11.75	11.75	Se.13, Se.25 QX	0.40
Utah-Apex	Boston	6	5⅞	6	Oc.3, Oc.15 Q	0.25
Western Utah Copper	N. Y. Curb	....	....	*5		
IRON						
Bethlehem Steel	New York	46⅞	44	46½	July, 1924	1.25
Cleveland-Cliffs Iron	Cleveland	80	70	78	Oct., 1926	1.00
Colorado Fuel & Iron	New York	44	41⅛	43⅛	May, 1921	0.75
Gt. North'n Iron Ore	New York	19⅛	19	19⅛	Dec.6, Dec.28	0.75
Inland Steel	New York	40⅛	40	40⅛	No.15, De.1 Q	0.62½
Mesabi Iron	N. Y. Curb	1	1	1		
Replogle Steel	New York	9⅛	9⅛	.9⅛		
Republic I. & S	New York	56	54⅛	56	No.15, De.1 Q	1.00
Republic I. & S. pfd.	New York	96⅛	96¼	96⅛	De.15, Ja.2 Q	1.75
Sloss-Sheffield S. & I.	New York	128	123	126⅜	De.10, De.20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	107	107	107	De.20, Ja.3 Q	1.75
U. S. Steel	New York	151⅛	144⅞	150⅛	De.1, De.30 Q	1.75
U. S. Steel pfd	New York	129⅜	128⅛	128⅛	No.2, No.29,Q	1.75
Virginia I. C. & C	New York	...	...	50	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	...	...	78	De.15, Ja.2,	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM						
De Beers Consol	New York	...	...	35¼	Ju.16, Ju.17	1.70
So. Am. Gold & P	N. Y. Curb	....	....	4		
Alum.Co.of Amer	N.Y.Curb	23	22⅛	22⅛		
Alum. Co. of Amer pf.	N.Y.Curb	81⅛	80⅛	81	Oct.1, Q,	1.50
Vanadium Corp	New York	42	41	41	De.1, De.15, X	1.00
ASBESTOS						
Asbestos Corp., New	Montreal	....	....	71⅛	Jan., 1926	1.50
Asbestos Corp., pfd.	Montreal	103¾	103¼	103¾	Jy.1, Jy.15, SA	1.75
SULPHUR						
Freeport Texas	New York	32⅜	30⅜	31⅛	Nov., 1919	1.00
Texas Gulf, new	New York	52	48⅛	51⅛	De.1, De.15, Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	47	47	47	No.19, De. 1, Q	1.00
Amer. Metal pfd	New York	....	....	113⅞	No.20, De.1 Q	1.75
Amer. Sm. & Ref	New York	136⅛	132⅜	133⅜	Oc.15, No.1, Q	2.00
Amer. Sm.&Ref.pfd.	New York	119½	119½	119⅜	No.5, De.1, Q	1.75
Consol. M. & S	N. Y. Curb	....	....	300	Jn.30, Jy.5 SA	3.75
Federated Metals	N. Y. Curb	....	....	12		
Newmont Mining	N. Y. Curb	75⅛	74	75	Oc.1, Oc.15, Q	0.60
Southwest Metals	N. Y. Curb	....	....	1		
U. S. Sm. R. & M	New York	36	35	35⅛	Oc.7, Oc.15, Q	0.87½
U. S. Sm. R.&M.pfd.	New York	46⅛	45⅞	45⅞	Oc.7, Oc.15, Q	0.87½

* Cents per share. † Bid or asked. Q. Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED NOV. 16, 1926

Name	High	Low	Last	Last Divd. Date	Amount
Aramayo Mines (25 frs.)	77/3	75/—	76/3	Nov. 1926	15 p.c.†
British Platinum (£1)	3/6	3/4½	3/6	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	14/9	14/3	14/4½	Aug. 1926	7 annas*
Bwana M'Kubwa (5s)	7/4½	6/9	7/—		
Camp Bird (2s)	3/11	2/9	2/9		
El Ore (£1)	6/—	5/7½	5/9	Nov. 1924	2½ p.c.*
Esperansa (10s)	—/9	—/8	—/9		
Frontino & Bolivia (£1)	8/3	7/9	8/3	July 1926	2½ p.c.
Mexican Corpn. (£1)	10/9	9/10½	10/6		
Mexico Mines of El Oro (£1)	21/10½	19/—	21/3	June 1926	7½ p.c.*
Oroville Dredging (£1)	3/—	2/10½	3/—	Dec. 1923	3¾ p.c.
Ouro Preto (£1)	2/3	1/10½	2/—	May 1925	2½ p.c.
Rhodesian Congo Border (£1)	95/—	84/4½	87/6		
St. John del Rey (£1)	9/1½	8/9	9/—	June 1925	6½ p.c.
San Francisco Mines (10s)	37/9	31/4½	31/9	June 1926	15 p.c.
Santa Gertrudis (£1)	15/4½	13/6	15/—	Oct. 1926	3½ p.c.
Selukwe (2s. 6d.)	12/1½	11/4½	11/9	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	4/—	3/6	3/9	Nov. 1917	75 p.c.
Tanganyika (£1)	44/6	41/—	42/6	Aug. 1926	7½ p.c.
Tomboy (£1)	3/7½	3/4½	3/6	July 1926	10 p.c.
Union Miniere du Haut-Katanga (Brussels)	9.000	8.700	8.750	July 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs. and free of taxation.